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FOUNDED 1872

VOL. CXVII
NO. 3012

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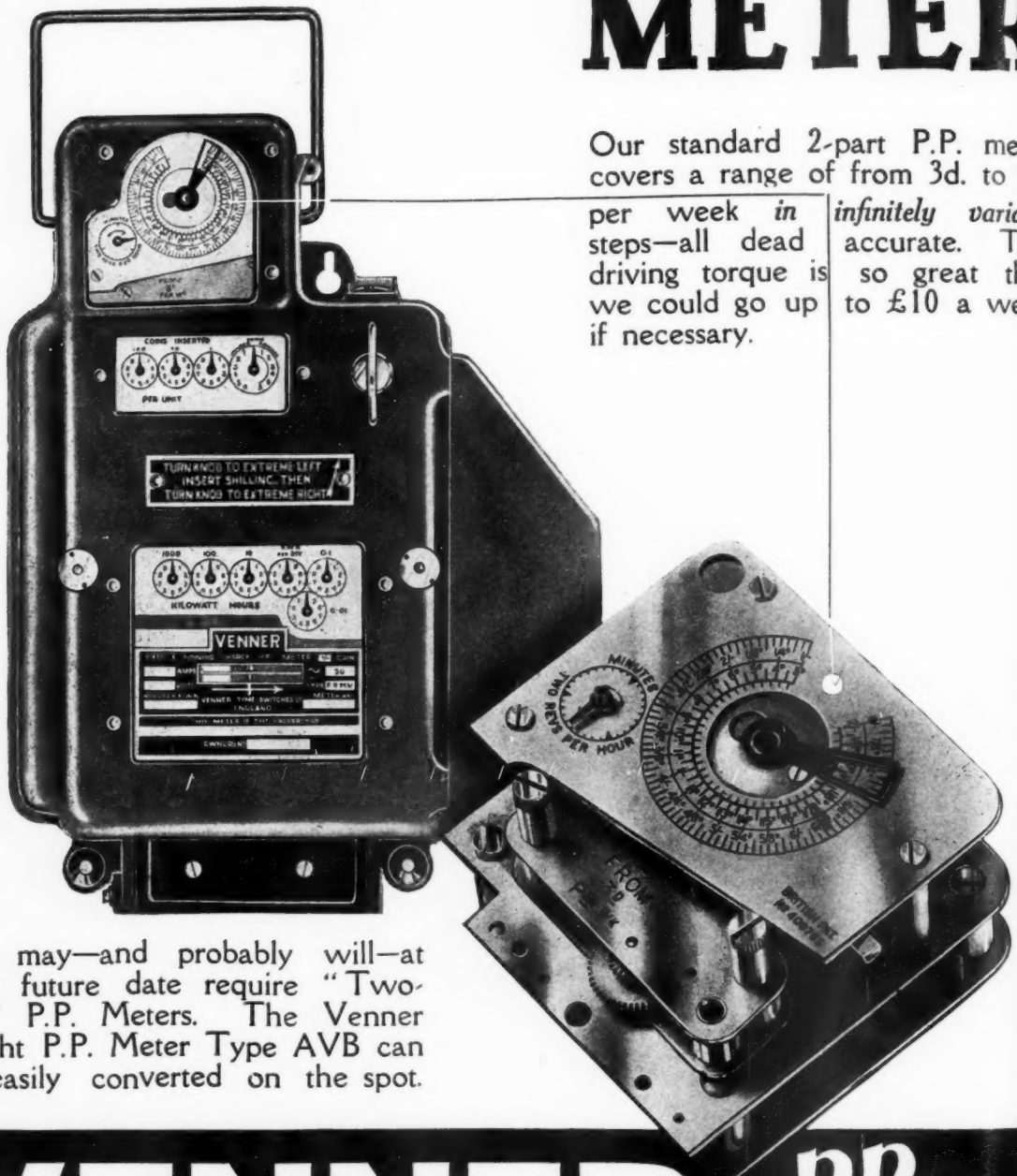

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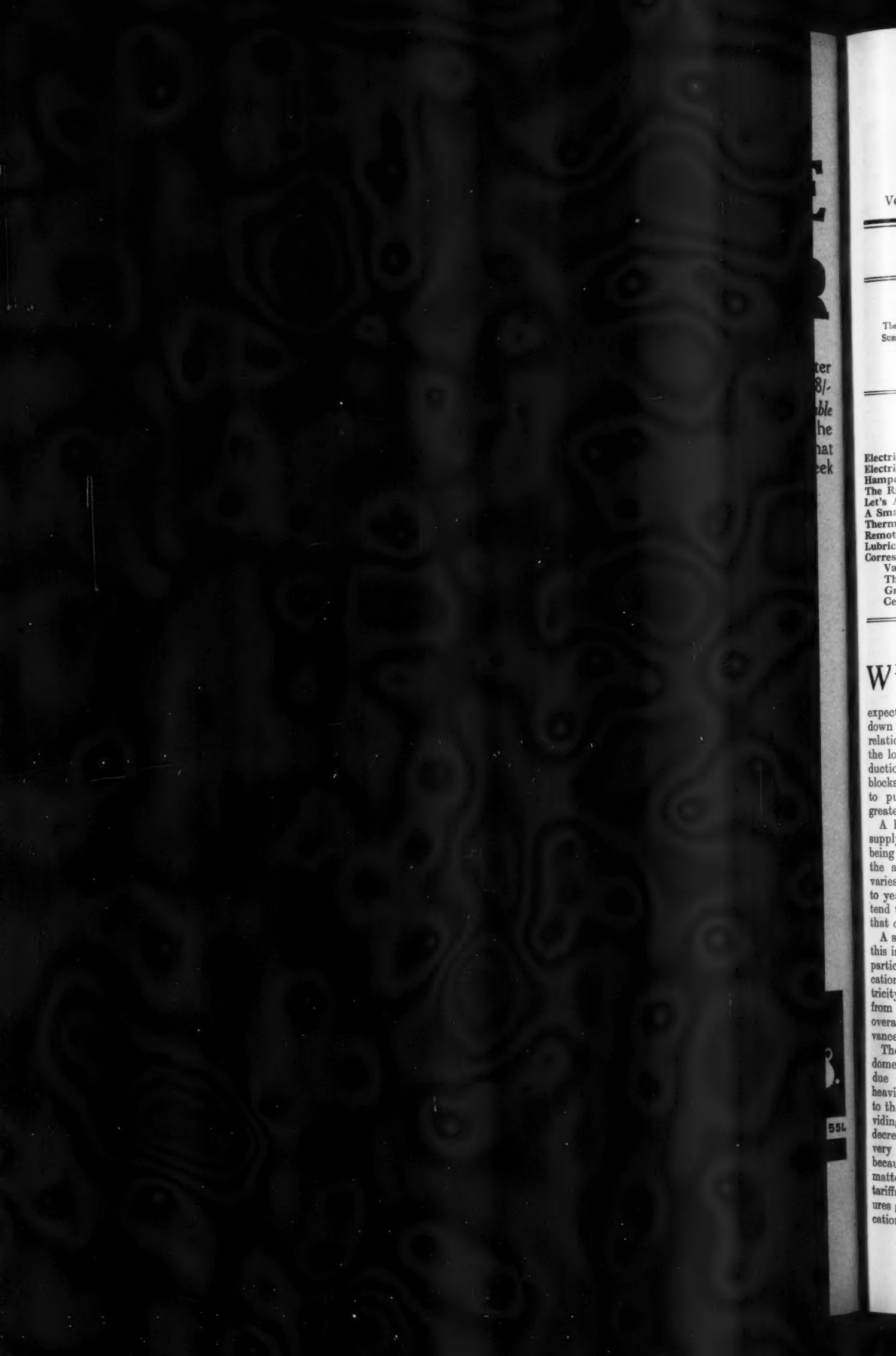

The
Electrical Review

VOL. CXVII. AUGUST 16, 1935. No. 3012.

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Loads and Load Factor

WE recently commented on the tendency to extend existing generating stations rather than to erect new ones. That this is only to be expected is a tribute to the foresight shown in putting down the earlier plants on the most desirable sites in relation to water supplies and centres of gravity of the load, which so greatly influence the costs of production. With the increasing need to handle heavy blocks of power as the larger works are changed over to public supply these considerations become of greater importance.

A high load factor still remains the chief aim of supply engineers—a favourable diversity in demand being merely a means of achieving that end. While the average load factor on our generating stations varies very little with the growth of load from year to year, the plant load factor of individual units will tend to improve due to interconnection, but this is all that can be done by purely engineering methods.

A study of financial statistics, such as that made in this issue by Mr. D. J. Bolton (who brings the salient particulars up to date from subsequent official publications) enables us to forecast certain trends in electricity supply. A weak point in drawing deductions from mass statistics is, as the author points out, that overall progress does not necessarily indicate an advance in all respects.

The progressively lowered average rate received for domestic supplies during the past few years may be due to price reductions or to a greater use of the heavier appliances; in so far as the former is conducive to the latter, and is not merely a substitute for providing adequate service, it is entirely justified. The decrease in the average overall revenue per kWh owes very little to any reduction in power prices. Perhaps because new works are being electrified almost as a matter of course, the stationary level of industrial tariffs may be thought to do little harm, but the figures given on p. 109 of our July 26th issue are an indication of how much existing mechanical power, a good proportion of it of the long-hour kind, remains to be converted to electricity under suitable tariffs.

While a high load factor is desirable for spreading the standing charges over a large number of kWh, it has the indirect effect of lower running costs by permitting the connection of loads of such magnitude as to make it worth while to supersede less efficient plant and also to pay more initially for new in order to attain the lowest running charges.

Criticism has been levelled against the scrapping of plant still capable of good service. Our national reluctance to do so is in turn criticised by foreign engineers. The question is even more than one of estimating whether the saving in operation costs is enough to balance capital charges on new units.

Regard has to be paid in our rapidly developing industry to the effect on the scale of operations of the growth of load anticipated within the next few years and also to the amount by which we can afford to increase capital charges in order to secure the low running charges that will enable us not only to supply existing consumers more cheaply but to go "all out" for those large industrial consumers at present incompletely electrified.

The Radio Show

THIS year's exhibition of radio apparatus at Olympia appears to indicate that the industry has reached something like stability. There are no revolutionary developments to be seen although there has been a continuation of the tendency to produce sets capable of "bringing in" programmes from many stations. This accounts for the fact that superheterodyne circuits are becoming general. It says much for the modern radio valve that in general one hears little of replacement troubles. This may, of course, be due to the urge which seems to possess the large body of users to go on from set to set in the pursuit of more and more programmes and still more "refinements." Thus, the valves outlast the set.

Mr. W. E. Miller, who describes the exhibition for us in this issue, found at least one crystal set. There are no doubt many listeners who sometimes wish that they could recapture the first fine careless rapture which the early days of broadcasting brought them. There is no reason why they should not; a crystal set and a good pair of headphones give a quality of reproduction that even now few superhets cum loudspeakers can rival.

Television

THIS year's show does not include television apparatus, as manufacturers are not anxious to injure their sales of ordinary receiving sets by leading the public to expect a full and satisfactory television service in the very near future. And yet just prior to the opening of the exhibition it was announced that arrangements were being made by the B.B.C. with the Baird and Marconi-E.M.I. Companies to provide the necessary equipment for the establishment of a television station at the Alexandra Palace. It is anticipated that the installation will be completed in about six months and that a regular public service will be inaugurated some time next year. This announcement is bound to have an influence upon the sales of radio sets, but as the cost of television receiving apparatus will be considerable for some time yet only the more affluent and the "enthusiastic amateurs" will be able to participate in this new form of entertainment for a year or two. The "ordinary listener" will still need instruments which reproduce sound only.

Compulsion and Registration

A RECENT article on the I.E.E. Regulations has reopened the discussion as to the desirability of making these compulsory upon electrical contractors, and has caused several correspondents to explore the various avenues which radiate from this starting point. Some of them have concentrated on the number of pins which a plug should possess; others debate whether the Electricity Commissioners have power to enforce the Regulations and if so whether they should use it; while a supply company's inspector considers that the difficulty of ensuring compliance with the Regulations—to say nothing of additions made after connecting up—would render compulsion useless. This last correspondent urges the compulsory registration of both wiremen and contractors, and very opportunely a registered wireman in New Zealand gives some information regarding the system in force in that Dominion. There is unanimity regarding the need for something to be done although the methods of procedure advocated may vary somewhat.

Poultry Farming Surveyed

FOLLOWING upon our reference last week to the paper read before the Burnley Show by Mr. A. Paull, we are glad to be able to bring to the notice of readers who are interested in extending the uses of electricity in poultry farming, a full survey which has been made by Mr. A. Cameron Brown, B.Sc., A.M.I.E.E., at the suggestion of Mr. P. A. Francis, of the Ministry of Agriculture and Fisheries. The author gives due acknowledgement to many farmers and electrical authorities in different parts of the country who have given valuable assistance in making the study as complete as possible. The needs of the small owner-farmers have been kept specially in view, and by such, when they have had experience, electricity is accepted as an asset. Cost in some areas, and fear of failures of electricity supply which might occasion distressing results, appear to be the only difficulties to be met. The pamphlet (73 pages) therefore contains information on both of these matters, though the greater part of the contents consists of illustrated descriptive particulars of incubation and rearing. Mr. Cameron Brown in his conclusions says that the fear of failure is "undoubtedly the biggest single factor" militating against the adoption of electrical methods where the tariff is otherwise favourable. While in populous districts interconnection of supply systems averts trouble which cannot be avoided in say Herefordshire or parts of Wiltshire, the stoppages, even in the latter areas, are rarely of important duration. It is truly said that the average person is so impressed by one or two failures that he gets the idea that they are more frequent and more extended than is actually the case, and he suggests that either the Electricity Commissioners or the undertakings should publish annual summaries of failures on rural lines. If this were done the justification for fear of failure might be removed.

Japanese Lamps

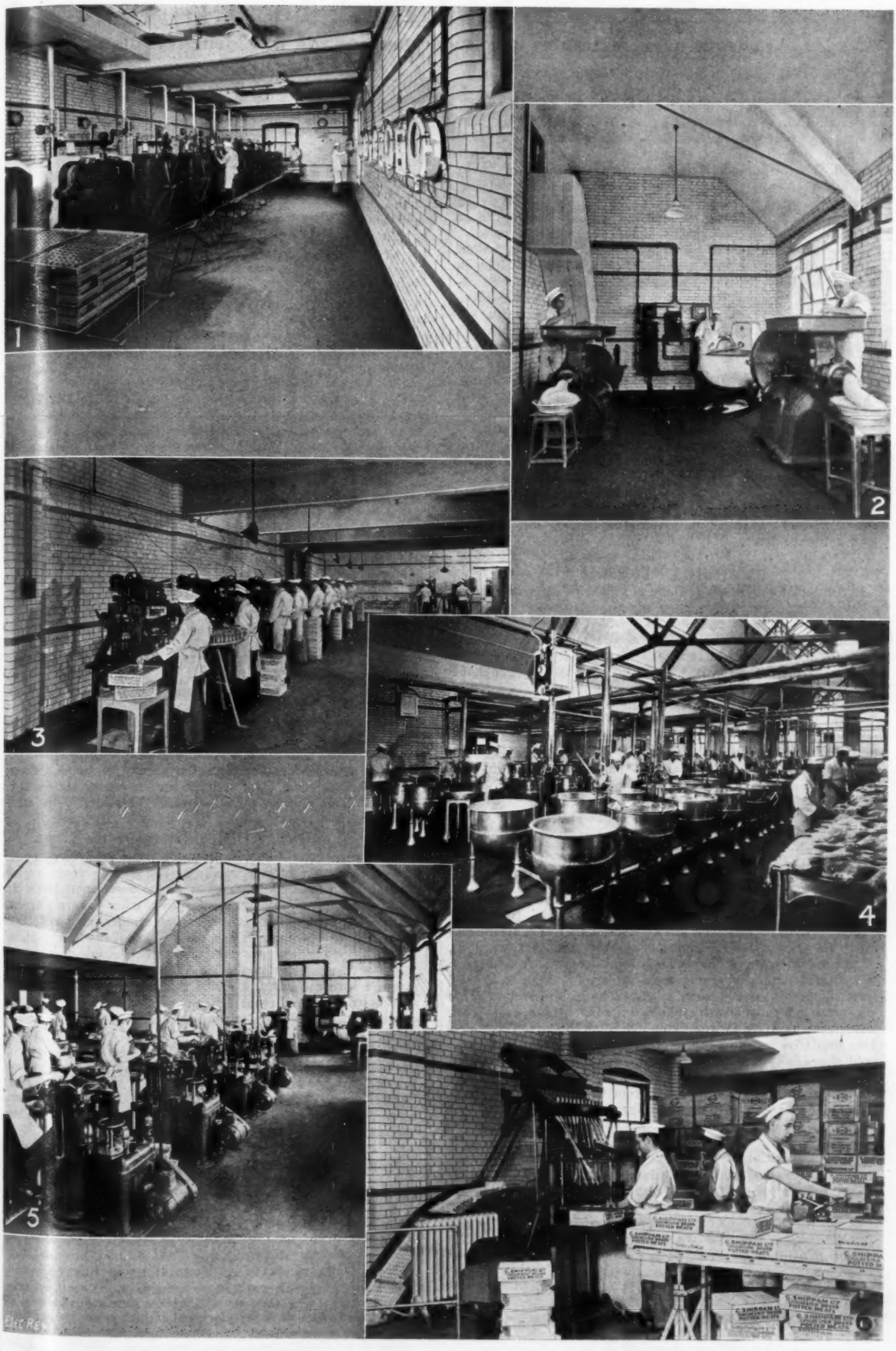
DURING the last two or three years much concern has been expressed regarding the influx of Japanese lamps into this country. They are sold at ridiculously low prices so that whatever their quality they easily find purchasers. The figures which appear on page 217 of this issue show that the bulk of these lamps are of the miniature variety such as are used for Christmas tree and similar decoration. Of the total value of those exported from Japan this country was responsible for the purchase of about a third and the United States somewhat more. About a quarter of the total Japanese exports of miniature lamps came to this country during the past year. As to the larger types (not exceeding 32 c.p.—not a very high figure) our imports were lower in value and were a smaller proportion of the total exports. This country does not figure in the list of importers of other Japanese electrical goods although India and South Africa were customers.

Electricity in Mines

NOT since 1930 has there been such an increase in the number of electric motors installed in and about coal mines as occurred during the year 1934. In the former year, according to the report of Mr. J. A. B. Horsley, Electrical Inspector of Mines, the increment was 63,000 h.p.; last year it was 61,000 h.p.; while in 1931, 1932 and 1933 the increases were only 17,000, 22,000 and 33,000 respectively. Practically the whole of the 1934 increase consisted of a.c. motors. The number of motors in use at June 30th, 1934, was 45,342 with an aggregate h.p. of 1,949,186, of which 82.8 per cent. was a.c. In spite of the expansion in the use of electricity in mines the accident rate has actually decreased; the average for the six years ended with 1934 was 60.8 per annum while in the preceding six years the figure was 65.3. There were fifteen fatal accidents in 1934 involving the loss of twenty-one lives, about half the deaths being due to shock. Five of the accidents were due to defective installation or maintenance and five to misuse, negligence or ignorance. There was a large increase in the number of non-fatal accidents—from 40 to 62—of which 56 were shock cases; the bulk of these were due to misuse or negligence. The development of remote control of coal cutters is welcomed as contributing to safe and efficient operation.

Tin Mining Activity

JUDGING by an exceptionally large increase in the amount of electricity supplied to tin mines in the Federated Malay States during 1934 the mining industry enjoyed a good year, while a further advance in the popularity of electricity in this field is also reflected. Nearly 176 million kWh was generated for these mines by plants of over 100 kW capacity, other than Government stations. In 1933 only 54½ million kWh was so generated. There was thus an increase of more than 230 per cent. An important factor has been the cheapness of electricity, most of the plant being hydro-electric. At the Ulu Langat Government hydro-electric station the total working cost per kWh generated was as little as 0.049d. One outcome of the increasing use of electricity in mines was that many more mining electrical engineers, chargemen and wiremen applied for certificates of competency under the Electricity Enactment, 1911, 451 being examined compared with 166 in 1933.



Electrical equipment at Messrs. C. Shippam's potted meat factory. **(See next page)**

1. Automatically-controlled sterilising retorts. 2. Mixing and mincing machines with incorporated motors. 3. Individually-driven labelling machines. 4. Section of the cooking room showing motor-operated "Modine" heaters. 5. 3-h.p. chain-drives for the hydraulic machines. 6. Automatic nailing equipment.

Electricity in a Food Factory

A change-over facilitates the modernisation of a Chichester plant

ALTHOUGH simple in lay-out, with mainly standard equipment, the recently modernised electrical installation at the potted-meat factory at Chichester of Messrs. C. Shippam, Ltd. (see pictures on page 203), is one of the best of the many schemes we have seen where advantage has been taken of the change-over of public supply to the modern 400/230 V three-phase system to bring the installation up to date. The old supply system was d.c., and the open-type slate panel distribution board which served for the installation under those conditions has been adapted for the internal control of the 230-V single-phase lighting and heating in the factory. For the 400-V three-phase power control there is a distribution board made up of ten 50-A triple-pole ironclad circuit-breakers supplied by the Electrical Apparatus Co., Ltd. Each circuit-breaker unit includes an interlocked isolating switch, three overload releases and an ammeter. The ten panels are arranged in two tiers with a central bus-bar chamber.

Shippam's main productions are meat and fish pastes, and the factory is laid out accordingly. The main processes are preparation, cooking, cooling, mixing, potting and sterilising. In connection with the first process we saw some excellent examples of individual and built-in drives. A chopping machine, for instance, has an 8-h.p. motor incorporated in its base. The one motor, through two sets of gearing, revolves the horizontal containing bowl about four vertically revolving knives.

A 5-h.p. motor is incorporated in a mincing machine. Two adaptation schemes, both with external chain drives, are a brawn cutter with a 1-h.p. motor and a chopping machine with a 10-h.p. drive.

Electricity for Cleanliness

In the cooking department there is very little electrical equipment, but we stress this section for two reasons. First, it is one example of a tremendous field which awaits the supply engineer's attention. We mean, of course, real commercial cooking. Secondly, in spite of the large quantities of steam necessarily produced for this cooking, every drive throughout the factory is electrical. Mr. Basil Shippam, who kindly acted as our guide, is electrically minded, and this may partly explain the absence of any other form of driving, but we feel certain that the efficiency and flexibility, and more particularly the cleanliness, afforded by electric driving would turn the scales in favour of the modern method in any case. The question of cleanliness is worth another word here, for it is all-important in such a factory, and this establishment is an "open house" for visitors at all times.

We saw many rows of steam-jacketed cooking pans which are served by two Lancashire boilers each 22 ft. long and 11 ft. in diameter, and it was rather startling to be told that one pan alone contained 150 chickens.

Steam condensation troubles have been overcome in the cooking room by the installation of "Modine" heaters at about 8 ft. from the floor level. Each unit has a steam coil with an electric fan behind it, and the resultant warming of the upper layers of air prevents condensation. A cold room is maintained at a temperature of 35 deg. F. by an externally located ammonia compressor, driven by an 18-h.p. motor. This compressor serves directly banks of coils in the cold room through which air is circulated by a motor-driven fan and two similarly propelled blowers. A compressor drive for three cold stores is typical of many auxiliary group driving schemes which are embraced by the conversion scheme. A 12-h.p. motor belt drives a countershaft from which secondary drives are taken for a 1,000-gal. per hour water-supply pump and a sausage-filling machine.

For producing the actual paste, the cooked meats are first mixed in machines which each have a pan revolving horizontally about a vertically revolving claw. The 5-h.p. motor in the pedestal effects both drives through gearing. The mixed food passes to mincers, where it is treated between revolving plates. An 11-h.p. motor is incorporated in the base of the mincer. As is the case with practically all the individually driven machines, start and stop push buttons are situated in positions convenient for the operatives.

The Filling Process

The final sequence of operations involved in potting is of the greatest interest both electrically and generally. Saxonia filling machines are situated at the end of six lines of stainless steel tables. Each filling machine is driven by a 3-h.p. motor, a chain from which drives a hydraulic pump. This affords a constant pressure on a plunger, which pushes out the paste from a feeding nozzle. Paste pots are held over the nozzle by hand, and the operative has the hydraulic pressure under hand control for the limits only of cutting off and releasing the pressure. On the remainder of the stainless-steel tables various operations, such as placing parchment discs on the surface of the filled jar, capping and hermetically sealing, are performed.

Automatic Control

All the filled containers are treated at 235 deg. F. in sterilising retorts, which are entirely automatically controlled by "Tycos Thermothym" regulators. The times and temperatures to which each retort full of paste are subjected are automatically recorded by Cambridge thermographs. The steriliser steam valves are compressed-air operated, the air being supplied by a neat compressor set with a 2.5-h.p. motor located on the horizontal receiver. Actually, the retort temperature controls the compressor which, in turn, governs the steam valves.

Electrically driven labelling machines, which apply gum to dry labels and the gummed paper to the pots, are almost human, and so is a nailing machine which will apply six nails at each of two sides of a packing case simultaneously.

We were much interested also in the British Miller Hydro bottle-washing machines, in each of which, on an endless conveyor and turntable, the bottles are subjected to a series of rinsing and brush cleaning operations. Each machine is operated by three electric motors. One 1½-h.p. drip-proof type, squirrel-cage, continuously rated, induction motor drives the jar chain and also the brush carriage. This motor is fitted with a push-button type starter. One ¾-h.p. totally enclosed gas-works type submersible motor drives the eight revolving brush spindles. This motor, which is subjected to a continual soaking of water, is also operated by a push-button type starter. The remaining 3-h.p. drip-proof type squirrel-cage induction motor, with shaft extension at both ends, drives two centrifugal pumps, one of which provides the pressure on the detergent jets, while the other sucks from the final cold rinse and delivers warm water through a coil to the warm rinse and the brushes. This motor is fitted with a push-button type star-delta starter with no-volt and three overload releases.

Among the other interesting equipment which make up this essentially electrical installation are a can-sealing machine in which electric soldering is effected in an evacuated chamber with an externally operated electric iron and a glass observation window; an endless chain elevator with a 1 in 2 feet incline and a 12-feet lift from the ground to the top floors; three Waygood-Otis lifts; tubular heaters under the racks in the cloak rooms and electric hot-water radiators in the labelling room.

Lighting Difficulties Overcome

Many directional lighting problems have been solved by the use of Benjamin fittings, while in the potting room we saw how quite an unusual difficulty had been overcome. Here, Mr. Shippam told us, all sorts of queer effects were obtained because of lamp filament reflections and counter reflections in and from the many shiny metal caps on the working benches. Many schemes were tried to overcome this, including the temporary installation of aluminium cooking pans covered with muslin as inverted lighting units, the success of which led to the present scheme with P.L.A. reflectors supplied by the General Electric Co., Ltd., with frosted tip projector lamps.

There is in all a total power load of 160 h.p. made up of mostly small motors, all of which, with the exception of those on the bottle-washing machine, which are of Lancashire Dynamo and Crypto production, were supplied by Messrs. Crompton Parkinson, Ltd., whose contracts department was responsible for the d.c./a.c. change-over.

Of the Crompton Parkinson motors, those for the labelling machines are of the "Minor" type with ventilating openings on the under sides of the end shields, and all the others are of their standard induction motor construction.

Electricity Price Reductions in France

Following the decree laws recently published in France, certain lay papers have stated that the reductions in rates are insufficient, and that the electrical industry has been relieved of more expenses than the amount of the reductions. In answer to these charges, the Professional Syndicate of Producers and Distributors of Electrical Energy has issued a statement pointing out that in recent years the electrical industry has had a definite and continuous policy of reduction in rates, and that the new reductions imposed upon it "threaten to compromise gravely the future of electrical distribution."

Electricity Supply Analysed. By D. J. Bolton

The trend indicated by the Electricity Commissioners' latest Return

THE Electricity Commissioners in their latest Return of Supply Statistics give the results of the twelfth year of working since these figures were first issued. This Return is the annual "bulletin" of the supply industry, marking the patient's slow but steady progress towards economic recovery. On the domestic side the figures reflect the gradual rise in the general standard of living and the access to amenities once the property of the very few. On the power side the figures are probably the best all-round index that we have to the pulse of industrial activity.

Unfortunately the figures suffer from one or two disabilities which militate against their immediate utility. In the first place they are always a couple of years old, and this time they are six or nine months later than usual. In some respects (*e.g.*, kWh generated) later figures were given in the annual report published in April, and some of these figures are embodied below. In the second place they include only authorised undertakings and so take no account of the large supplies generated for traction, colliery, and private industrial purposes. This is a serious omission when dealing with the power load, and a complete picture of industrial electrification can only be obtained once every five years or so when the Census of Production is taken.

Another limitation which may be mentioned concerns the usefulness of the cost figures given in the Return. Although all the separate cost items are set out, there is no attempt to allocate these into their fixed and running components. It is, therefore, difficult from the figures as they stand to see how the costs are built up, or to make a comparison between costs and tariffs. Fortunately, such an allocation is not difficult to carry out from the data given, and this will be done in a subsequent article.

Continuous Progress

The outstanding feature of this, as of previous Returns, is its record of steady growth in plant capacity, maximum load and mean load (or kWh generated). Fig. 1 shows these results, together with the fuel consumption, for the twelve years since the Returns were first issued. Not all of this

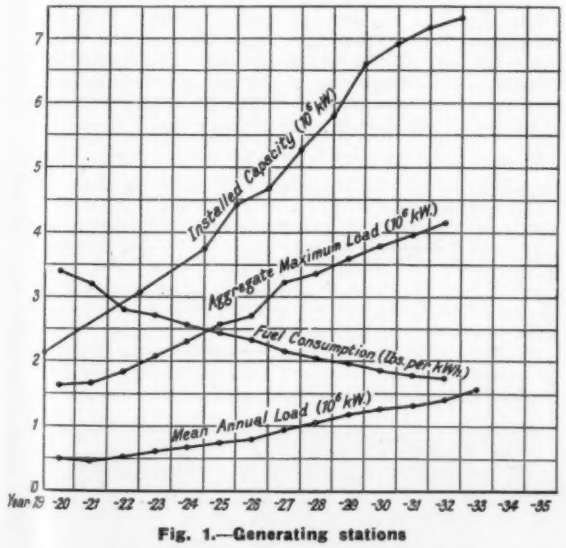

Installed Capacity (10⁶ kW.)
Aggregate Maximum Load (10⁶ kW.)
Fuel Consumption (lbs. per kWh.)
Mean Annual Load (10⁶ kW.)
Year 19 -20 -21 -22 -23 -24 -25 -26 -27 -28 -29 -30 -31 -32 -33 -34 -35

Fig. 1.—Generating stations

growth can be correctly described as "progress," since the aim should be to keep the upper curves from rising so fast as the lower. One result of the grid lines will undoubtedly be a smaller margin of installed generating capacity, but this will only appear as the older and less efficient plant becomes superannuated. Up to the present the top curve shows only a slight tendency to bend over, and the margin is still some 70 per cent. above the aggregate maximum demand. In a similar way the ratio between the maximum and the mean is improving very slightly, and the present average load factor is 34 per cent. On the same graph is shown the average fuel consumption per kWh generated. This has fallen almost exactly one-half in the twelve years illustrated (from 3½ to 1¾ lb. per kWh approximately).

The next step is to analyse the load. Fig. 2 shows the total energy sold to consumers, in the form of a number of parallel belts. Power and traction sales are plotted above the horizontal zero line and lighting and domestic below it, and the width of each belt represents the number of kWh sold. The power sales are characterised by spells of rapid growth interspersed by periods of lull and (in one case) of actual retrogression. The lighting and domestic load on the other hand has shown a smooth and steady rise throughout the whole period, and is now rather more than half as big as the power and traction load.

The actual figures for kWh generated and sold in the last year illustrated are about 7 per cent. above the previous year:

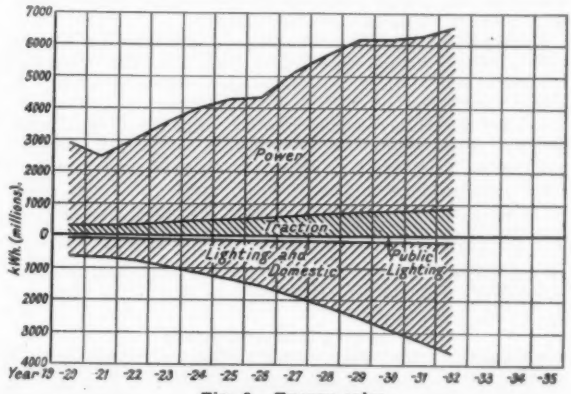


Fig. 2.—Energy sales

in the year following (1933—covered by the annual report) a further increase of about 10 per cent. is noted. But before we congratulate ourselves on such a rise it is well to remember that much of it is the almost automatic result of housing and factory expansion, *i.e.*, due to causes which lie outside our control and whose growth owes nothing to our efforts. Only by much more detailed figures can one discover how much of the growth of the power load, for example, is due to a change-over from private to public supply, how much to the electrification of processes once driven directly by prime movers, and how much to new factories and expanding industrial activity. Similarly on the domestic side it would be very instructive to analyse the growth into its two or three components, *i.e.*, the increase of the non-lighting consumption in houses already wired, the change-over from alternative forms of lighting and heating, and the building of new houses, electrically wired, under private and municipal enterprise. It might then be found that instead of making steady and satisfactory progress on all fronts we are doing much less than we should (or even retrogressing) in certain directions. In the absence of such information it is well to check complacency with the thought that an overall rise of seven to ten per cent. may easily mask some bad spots.

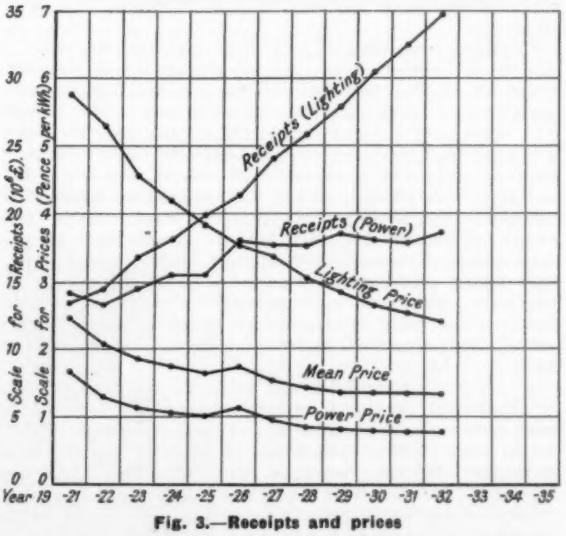

Receipts (Lighting)
Receipts (Power)
Lighting Price
Mean Price
Power Price
Receipts (10⁶ £). Prices for Scale (Pence per kWh).
Year 19 -21 -22 -23 -24 -25 -26 -27 -28 -29 -30 -31 -32 -33 -34 -35

Fig. 3.—Receipts and prices

Efficiency of Supply

The generation efficiency is best shown by the fuel consumption, already illustrated. But the overall efficiency of the supply system covers many more factors than this and can be expressed only in economic terms. Moreover, since only about 12 per cent. of the total turn-over goes in fuel costs,

Hampden in East Ham. By Lex

IN the case recently before the Court of Appeal concerning the certification of meters Lord Justice Slesser might well describe the respondent, Mr. Joseph, as another Hampden. Usually it requires a person of considerable courage and financial means to fight a Corporation on a question of principle for that, surely, was the real issue and not the mere amount of money involved.

It is, perhaps, one of the defects of our legal system that an authoritative decision on a doubtful point of law can only be obtained by private litigants at the risk of incurring considerable expense. Had the Corporation in this case succeeded in its appeal Mr. Joseph would not only have had to pay his own costs, which would have amounted to a fairly large sum, but also those of the Corporation.

There are not many consumers who are prepared to face such a risk, with the result that many doubtful questions remain unsettled and consumers are frequently unable to obtain the redress to which they believe they are entitled. It is usually the supply authority which is in the advantageous position, for in case of dispute it can refuse to give a supply and unless a consumer is prepared to contest its ruling in the Courts he must submit to it. Numerous instances could be cited in which a supply authority has sought to exercise powers in respect of a consumer's installation or supply which it was doubtful if it, in fact, possessed, but it has been able to get away with it largely because the consumer was indisposed, or could not afford, to take the risk of opposing its action.

Common Misconceptions

For example, until recently many electricity authorities had an entirely wrong conception as to their powers of enforcing the I.E.E. Wiring Regulations. Others had misconceptions as to their obligations when changing over a consumer's supply from d.c. to a.c., and now we have this further misapprehension in regard to their powers to cut off supply where a consumer has a meter which has not been certified by an electric inspector.

It need not surprise anyone that the true legal position has only just been revealed. It is not altogether the fault of the legislature or of the construction of the Acts. The true explanation is to be found in the fact that so very few people have had sufficient temerity to challenge the interpretation put upon the law by electricity authorities.

Incidentally, this is not the first occasion on which a dispute has arisen in regard to the method of registering the true value of a supply given to a consumer. In *Hendon Electricity Supply Company v. Banks* (1918) it was held that where a dispute arises between an undertaker and a consumer as to whether a meter is or is not in proper order for correctly registering the value of the electricity consumed, the dispute is to be determined by the electric inspector as provided by Clause 57 of the Schedule to the Electric Lighting (Clauses) Act, 1899, and that when an electric inspector has not been appointed under Clause 35 of the Schedule no cause of action arises against a consumer for electricity claimed to have been supplied by the Corporation. If one may venture to say so, it is a pity that the East Ham Corporation did not pay greater regard to this Clause before going to the length of cutting off a consumer's supply.

Effect of the Decision

However, the decision need not cause undue disturbance or have the awkward consequences that some people seem to anticipate as it is not likely to result in hosts of consumers refusing to pay their electricity bills. It is only where there is a dispute that the question really becomes important.

One good effect that will probably flow from the decision is that it will cause electricity authorities to hesitate before adopting the drastic method of refusing a supply or threatening to cut off a consumer's supply, and will induce them to resort to the proper procedure. Incidentally, it would seem to be advisable for a body such as the I.M.E.A. to go more closely into the whole question of the obligations and rights of electricity undertakers in respect of consumers. There can be little doubt that unnecessary litigation might have been saved in the past and many wrongs which have been perpetrated on consumers might have been avoided had Corporations been properly advised as to their powers.

Electricity Supply Analysed (*Continued from preceding page*)

these other factors such as capital charges, rates and management expenses exercise a large and increasing influence on the whole economy. Probably the best single criterion to the economic "efficiency" of the system as a whole is the overall price at which the electricity is sold. But this price must be considered in relation to two factors both lying outside the control of the industry itself. On the one hand the price is fixed partly by what it will fetch rather than what it costs, *i.e.*, by commercial as well as by economic factors. In the second place the cost must be related to the cost of the raw materials employed, and this point is illustrated in a later paragraph.

The three lower curves in fig. 3 show the mean prices for lighting and power energy, and the average for all purposes. Prices fell steadily from 1921 to 1925, and the lighting price has continued to fall at about the same rate to the present day. This drop is partly due to actual price reductions and partly to an increase in the proportion of the non-lighting domestic load. The power price fell only slightly from 1926, and is now very nearly steady. Turning to the question of receipts it will be seen from the two upper curves that at the commencement of the period the receipts from the two main groups of consumer were approximately equal. Receipts from power consumers rose somewhat until 1926 since when they have been almost exactly constant. The lighting receipts, however, have risen steadily in spite of falling prices, and are considerably more than double what they were twelve years ago.

It was mentioned above that prices do not of themselves tell the whole story of electricity supply "efficiency." The next step in this connection is, therefore, to relate this price to the price of other commodities and to show or attempt to show that electricity has gone down more than they have. The chief "raw materials" which go into the making of electricity are the cost of plant, coupled with the interest on the capital expended thereon, and the price of fuel. The former is, of course, the chief element entering into the fixed cost and the latter constitutes almost the whole of the running cost. Besides these two major items there are wages (largely at the generating station) and salaries of administration staff (largely on distribution), together with a considerable and increasing levy of rents and local taxation.

The graphs in fig. 4 show percentage prices, with 1921 taken as 100. The mean energy price is replotted from the previous figure, together with the mean coal price per ton paid by authorised undertakings, the mean price of electrical plant and the mean rate of interest on capital. The price of plant is taken from the "weighted average" given in table XIV of "The Electrical Industry of Great Britain" (B.E.A.M.A. Publication 1929). These figures stop short at 1928, but they show very well the trend up to this date. The price of capital is taken as the mean rate of interest on Government stock over the period in question. This was calculated by taking 2½ divided by the market price of 2½ per cent. Consols.

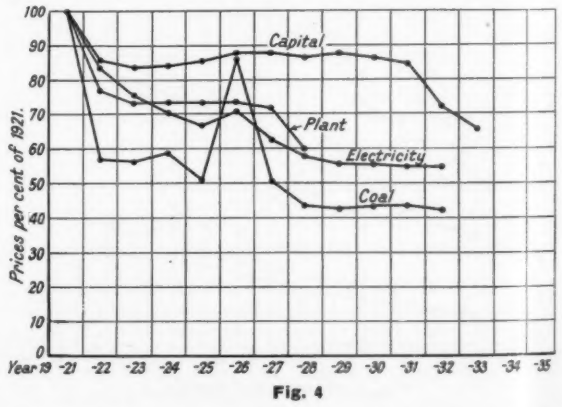


Fig. 4

It will be noted from the graphs that the electricity price fell more uniformly and to a greater extent than any other except coal. The latter fell very heavily the first year followed by a slight fall thereafter, interrupted by a sharp rise in the year of the coal strike.

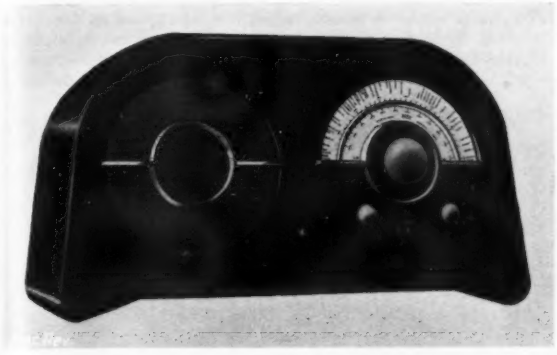
The American I.E.E. Convention

The *Electrical World* says that five technical sessions in the fields of power transmission, electrical machinery, communication, electrophysics and measurements are included in the programme of the Pacific Coast convention of the American Institute of Electrical Engineers at Seattle, Wash., on August 27th. Many papers deal with western engineering developments, and they have been prepared by well-known engineers on the Pacific Coast. The engineering features of the Boulder Dam-Los Angeles lines and the 287,000-V coupling capacitors for the carrier-current communication channels will be discussed.

The Radio Exhibition—I. By W. E. Miller, B.A.(Cantab.), M.I.W.T.

A survey of the receiver exhibits at Olympia

THIS year's Radio Exhibition opened on Wednesday last and will continue until August 24th. As usual, the *venue* is Olympia, and the Grand Hall and its gallery are filled with trade exhibits, while adjacent to the Grand Hall there is an extensive G.P.O. exhibit, and the Broadcasting Theatre.



The Ekco " A.C.86 " table superhet receiver, with black moulded cabinet and chromium plated fittings

In all, the exhibitors number nearly one hundred and seventy. No television receivers are shown, since the organisers do not feel justified in admitting this type of apparatus until a public service of high-definition television becomes available.

The presentation of the exhibition this year is extremely attractive, with changing colour illuminations of the large cycloramic display at the west end of the Grand Hall. To give a complete and detailed account of the various exhibits is a task which would necessitate several days at Olympia, and would fill many pages of this journal. The aim in this article is to give a summary of the main features of 1935-6 radio receiver design as revealed by the show, while a later article will deal with other exhibits, such as valves, loud-speakers, components, batteries and other apparatus.

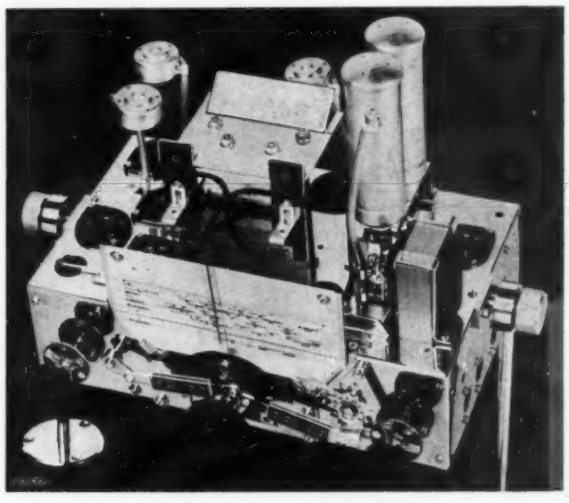
Receiver Features

As might be expected, the superheterodyne circuit is still the most popular one among set manufacturers, and there are very few exhibits of receivers which do not consist mainly of sets of this type. Many of these are of the three to four valve (plus valve rectifier) class, making use of multi-stage valves in certain positions. On the other hand, receivers and radio-grams with up to fifteen valves are to be seen, these, of course, falling in the higher priced class. Generally speaking, the price levels have changed very little since last year, and the popular type of table superhet is usually listed at from eleven to fourteen guineas. Lower priced sets are generally of the simple tuned h.f. type.

Most of the receivers this year are fitted with some form of automatic volume control. In some cases, ordinary delayed a.v.c. is employed, but in the slightly higher priced class, there is a tendency to standardise " quiet " and amplified a.v.c. In its " quiet " form, there is dead silence between stations as the tuning control is rotated, while the amplified type of a.v.c. generally results in a better control than is available with the simple form. Another feature of many of the modern superhets is automatic tone compensation, which operates in conjunction with the volume control, and increases the bass response at low volume levels.

For the first time, variable selectivity for superhets is featured by a number of manufacturers. Last year the Gramophone Co., Ltd., the Marconiphone Co., Ltd., the Radio Gramophone Development Co., Ltd., and one or two others included this feature in their more expensive models. This year other concerns such as the General Electric Co., Ltd., Philips Lamps, Ltd., A. C. Cossor, Ltd., Kolster-Brandes, Ltd., and Lissen, Ltd., to mention only a few, include variable selectivity in models which are often of comparatively low price. The object, of course, is to provide a higher degree of fidelity of reproduction with moderate selectivity for local station reception, combined with high selectivity, and a sacrifice of the upper register, when receiving distant stations free from interference due to adjacent transmissions. Thus at last it seems to be becoming generally recognised that the ordinary superhet only gives a compromise between tone and selectivity.

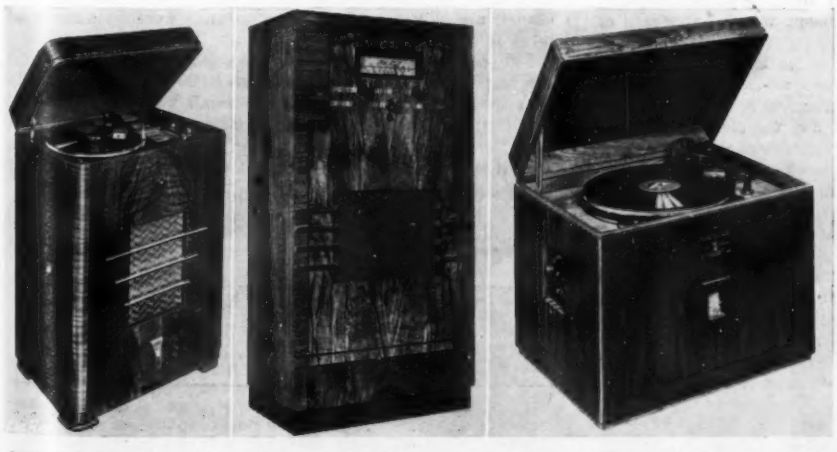
" High Fidelity " is undoubtedly the slogan of many firms this year. In most cases, this is justified, but in others there seems to have been very little attempt to improve on last year's models, except, perhaps, to incorporate a somewhat larger speaker.



An example of modern chassis construction. An exhibition model of the Mullard " MU35 " universal superhet

Apart from the followers of the superhet circuit, there is a small, but none the less important, band of manufacturers of high fidelity apparatus who pin their faith to " straight " receivers with tuned h.f. stages. Among these may be included Hartley-Turner Radio, Ltd., Haynes Radio, H. Hacker and Sons and the Prism Manufacturing Co., to mention only four. Since the products of these firms are largely individually built, the prices are necessarily a little above the average.

For some time it has been apparent that designers have been handicapped by the necessity of including the loudspeaker in the cabinet with the receiver. There is no real reason for this, except convention, and this year several firms supply receivers with no self-contained speaker, these including Hartley-Turner, Haynes, the City Accumulator Co., Ltd., and Radio Instruments, Ltd. The breakaway is by no means general, however, In other cases, improvement in reproduction has been sought by the use of special output



Left: The " Fidelity Radiogram 5 " (G.E.C.) incorporating variable selectivity as an aid to high fidelity response. Centre: The Marconiphone Model 236 universal superhet, a console model, priced at 15 guineas. Right: One of the special radio-grams developed for school use by Radio Instruments, Ltd.

stages, twin, triple, or even quadruple speakers, and special cabinet design.

"All-wave" Sets

Another tendency this year is for manufacturers to show one or more so-called "all-wave" models, to cater for the interest in ultra-short wave reception. In most cases the extra wave-bands go down to 10 or 15 metres, but in no case is the complete wave-band up to 2,000 metres covered without breaks. All-Wave International Radio and Television, Ltd., in one of its models covers from 12 to 560 metres without a break, and 800 to 2,000 metres, but this is unusual. Generally one or two extra wave-bands are included in more or less standard receivers, to cover up to 50 or 80 metres. "All-wave" sets are also shown by Decca, H.M.V., Philips, Climax, Stratton and Co., Alba, Ever-Ready, Dynatron, and Burndept. Kolster-Brandes have provision in their sets for the use of an external short-wave converter, while several firms manufacture converters for use with ordinary broadcast models.

A careful survey of the exhibition fails to reveal any d.c. receivers this year. In practically all cases manufacturers show d.c./a.c. models, which can be used on either type of supply without alteration. They employ the special universal type of valve, with series-connected heaters and barretters. Battery receivers are still prominent, many of them having Class B or q.p.p. output stages for high outputs with battery economy. In many cases their performance is comparable with that of corresponding mains models. On one or two stands midget battery sets are on view employing specially small valves. One firm at least, N.R.S., Ltd., is showing a crystal receiver.

Tuning Scale Fashions

Many and ingenious are the arrangements designed to provide easy tuning in modern receivers. Dials are mainly of the "full-vision" type, with a pointer, band or spot of light moving over the scale, which is calibrated in wave lengths and marked with station positions. The Ferranti "All-in" dial is an interesting one, since not only is there the usual tuning calibration, but the positions of the volume, tone, and wave band controls are also shown on the dial by means of a number of pointers, while a tuning indicator, showing when the set is correctly in tune, is fitted. The so-called "Airplane" dial is favoured by many this year, and is of the circular type, with a dual pointer. McMichael Radio, Ltd., have a very large illuminated dial on some of their sets, while E. K. Cole, Ltd., have large semi-circular dials for easy reading. Cossor favour "Thermometer" tuning, while Ultra still retain their "Clock Face" dial. The City Accumulator Co., Ltd., has what is called "Scanning Disc" tuning on some of their models, while the K.B. "Fototune" is another interesting device.

Tuning indicators, showing when a receiver is accurately in tune, and therefore giving the best quality of reproduction, are again fitted by many firms. These are generally small moving-iron milliammeters or arrangements whereby a band of light on a scale is caused to contract or expand as the carrier wave is accurately tuned. Special small neon tubes, made by Cossor and the G.E.C., are also largely used.

Special Receivers and Amplifiers

Car radio receivers are now produced by a number of companies such as E. K. Cole, Ltd., the G.E.C., City Accumulator Co., Ltd., the Marconiphone Co., Ltd., Philips, and the Decca Gramophone Co., Ltd. In most cases these employ the universal type of valve, with paralleled heaters, to run from the 12-V car accumulator; h.t. supply is from a separate or built-in rotary transformer or a vibrator unit. The Decca models are interesting in that they are transportable and a simple plug arrangement enables them to be used in the car from the 12-V supply, or in the home from the usual a.c. mains.

Radio Instruments, Ltd., is concentrating this year on specialised receivers for use in schools, five of its models having been approved by the Central Council for School Broadcasting. Special attention has been paid to the reproduction of speech.

Many firms at Olympia specialise in public address apparatus, radio relay amplifiers, and similar equipment. It is not possible to mention them all, but Tannoy Products, Ltd., shows a very wide range of apparatus, as do also Ardente, Film Industries, Ltd., and Ossicaide.

In summing up one's impressions of the receivers and similar equipment on show, it is safe to say that there seems to be a notable tendency for the manufacturers to aim at reliability of their products, rather than at extremely low prices. This policy must react favourably upon the public during the coming season, while the dealer should find his service problems eased to a considerable extent.

Let's All Go All-electric! By R. N. Jones

Even the poor electrical man finds that it pays him

THE costs of running all-electric houses that have been given in the technical Press have usually referred to fairly large houses occupied by people of fairly large incomes.

I am a switchboard attendant and therefore receive a "beggarly pittance," which should silence any critic in similar circumstances who may say that electricity is too expensive, and in any case I can't afford the appliances. In my case the appliances were not all purchased at once but over a period. Any young fellow in the industry who is contemplating setting up a home of his own will find that electrical appliances can be purchased as cheaply as gas appliances.

Column "A" of the table relates to a house which was "all-gas" except for lighting. This is accounted for by my wife having been previously an assistant in the local gas showrooms; thus the victory of electricity has been won in the face of considerable opposition. I have kept records of costs for the last six years and give details below for three typical years with mixed systems and for 1934 under all-electric conditions. The house referred to in column A had five rooms, with eight lights. There were no power plugs, and the electric iron was used from the lighting circuit. The coal fireplace was removed from the dining room and a gas fire substituted. A gas cooker and wash boiler were used. Column B relates to an eight-roomed house having thirteen lighting points, ten plugs, a 2,000-W water heater, 2,000-W radiator, iron, vacuum cleaner and wireless set, together with a gas cooker and boiler. Column C refers to the same house after a Moffat electric cooker had been substituted for the gas cooker and the gas wash boiler had been removed. A small portable boiler is used on the hot-plate of the cooker for boiling small articles of clothing. The "gas year" was the most expensive (undoubtedly due to the gas fire), although there was not the same convenience as in the larger house.

Advantages of the All-in Tariff

The tariff for A, B and C was 6d. per kWh for lighting and 1d. for heating, cooking and power. In column D are given the figures for last year under an all-in domestic tariff of 5 per cent. of the rateable value and ¾d. per kWh for the first 240 kWh per quarter and ½d. per kWh for the remainder. The fixed charge is £3 16s. per annum, payable in equal quarterly instalments. The consumption was 3,196 kWh (1,404 kWh in the summer quarters and 1,792 kWh in the winter), and the net payment, after deducting 2½ per cent. discount, was £11 3s. 5d.

The saving of labour in the home due to not burning coal must be experienced to be fully appreciated, and the absence of dust is very marked.

It is satisfactory to feel that one's own little effort is bearing fruit as our friends now make greater use of electricity as a result of our satisfactory experience, which appears to have a snowball effect and makes me wonder what would happen if all members of the industry were 100 per cent. electric and did their share in propaganda work by making the most of it.

I do not claim any records for consumption or low cost, but the figures can be seen to show that 3,000 to 3,500 kWh is the average annual consumption for a small house, which should enable anyone to work out his probable cost. My figures show that the all-electric house is within the reach of most of us, and that the great convenience and cleanliness will amply repay the change-over.

TABLE OF COSTS.

	A.	B.	C.	D.
Summer Quarters:	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Electricity	1 13 0	1 1 3	5 3 10	5 6 6
Coal	2 0 0	2 0 0	—	—
Gas	2 6 10	1 9 9	—	—
Total	£5 19 10	£4 11 0	£5 3 10	£5 6 6
Winter Quarters:				
Electricity	3 7 2	2 14 2	5 19 7	6 2 8
Coal	3 0 0	3 10 0	2 15 0	—
Gas	4 12 9	1 19 5	—	—
Total	£10 19 11	£8 3 7	£8 14 7	£6 2 8
Total for year ...	£16 19 9	£12 14 7	£13 18 5	£11 9 2

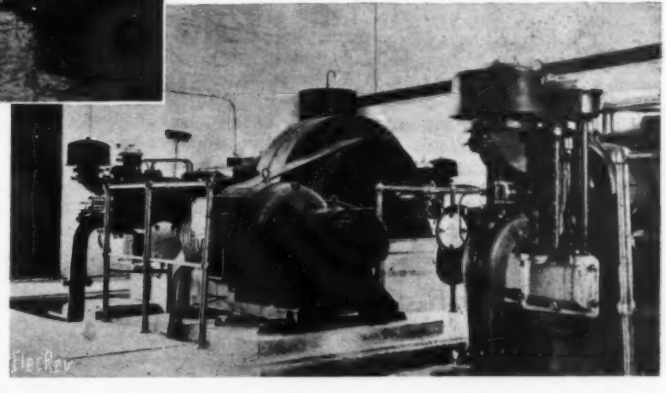
A Small Welsh Power Plant

Oil engines used in conjunction with water power

THE advantages of water power in conjunction with a crude-oil generating plant are well illustrated by the recently opened electrification scheme for the two small Merioneth coastal resorts of Towyn and Aberdovey.

A site for generation was selected at some disused lead mines half-way between the two towns and an old headrace about half-a-mile long which once brought water to two wheels in the lead workings was recommissioned. An 18-in. pressure pipeline about 900 ft. long brings the water to a turbine house, in which is installed a 50-h.p., 1,000-r.p.m. Gilkes Francis turbine direct-coupled to a 33-kW Brush 400-V three-phase alternator. The speed is controlled by a Gilkes oil governor and the voltage by the Brush system of overcompounding the alternator by means of rectified current from the main a.c. supply, which acts through an auxiliary winding on the exciter field. The water-power set can, unattended, maintain the correct voltage at all loads.

The energy generated is transmitted 300 yd. by overhead lines to the main power house—a stone building in which are installed two 100-h.p. Brush-Diesel opposed-cylinder horizontal oil engines, each driving by "Texropes" a 66-kW, 400-V, three-phase Brush alternator. The engines are provided with "Burgess" silencers and the main water supply is taken from the pressure pipe-line to the turbine set, but an auxiliary water supply is obtained from a Gilkes "GGG" self-priming, motor-driven pump, drawing water from the main stream immediately below the power house.



Source of the water power (left), and an interior view of the oil-engine power station

A three-panel switchboard with synchronising equipment controls the outputs of the sets, which are arranged for parallel running. The output of the plant is stepped up to 11 kV by a 170-kVA transformer for the overhead transmission system serving the two towns, which has a length of about five miles.

Step-down sub-stations (100 kVA in Towyn and 80 kVA in Aberdovey) are housed in central buildings, and 25, 10 and 5-kVA pole-type transformers serve groups of houses situated along the transmission line. The risk of salt encrustation of the insulators due to the proximity to the sea, has been met by the use of 22-kV insulators, and a set of G.E.C. lightning arrestors provides against atmospheric surges. The 400/230-V output of the sub-stations is distributed in the town through "Lucy" distribution boards.

Underground cables are used in the more central parts, and overhead four-wire lines in the outlying parts. In addition, a street lighting switch-wire is run through both underground and overhead mains.

A two-part tariff of 7½ per cent. per quarter on rateable value for private houses and 10 per cent. for shops, plus 1d. per kWh, is offered. The alternative is a flat rate of 8d. per kWh with reductions for quantity. The power rate is 2d. per kWh. About 200 consumers are connected, but it is expected that this number will be doubled soon. The bulk of the capital of £13,000 has been subscribed by the inhabitants.

The main contract was given to Messrs. Gilbert Gilkes & Gordon, Ltd. (who carried out schemes for the neighbouring towns of Machynlleth and Dolgelley), and Mr. W. M. Harris, A.M.I.E.E. (director of the company), was responsible for the design of the scheme. The oil engine, generators, switchgear and transformers, were supplied by the Brush Electrical Engineering Co., Ltd., and the distribution cables, services, &c., by the Liverpool Electric Cable Co., Ltd.

Although the work was only started on January 1st, the scheme was inaugurated on June 26th by Mrs. Davies, wife of Dr. Alban Davies, of Towyn, chairman of the Towyn and Aberdovey Electric Supply Co., Ltd. The company was granted a Special Order after it had been ascertained that a bulk supply would not be available. It is expected that the company will later develop one of the larger water powers in the district, which is estimated to be capable of supplying up to 300 h.p.

Bale-stacking Trucks

BALE-STACKING equipment used at the Frizinghall (Yorkshire) depôt of the London, Midland and Scottish Railway consists of two B.E.V. trucks manufactured by Messrs. Wingrove & Rogers, of Liverpool. They are designed to pick up, elevate and stack bales of wool or other similar merchandise, while they are also capable of reclaiming bales from the stack and delivering them to any point required. They are constructed to lift bales of up to 5 cwt. and of a size averaging 2 ft. 6 in. wide, 2 ft. 6 in. high, and 5 ft. long and to stack them five tiers high. Carrying a full load the trucks will travel at a speed of 5 m.p.h. on the level and will lift 5 cwt. at an average speed of 1 ft. per second. Brakes are fitted on the two driving wheels and are normally "on" until the pedal is depressed by the operator standing on the truck platform. An automatic solenoid brake, operating on the worm shaft of the winding drum, holds the load in any intermediate position when the power is off. Power is supplied from a 32-V "Exide" battery of 161-Ah capacity having sixteen cells fitted in an easily accessible and withdrawable box between the two axles. The battery will operate the truck under average conditions of lifting and travelling for six hours on one charge. The motors (1.4 h.p. for hoisting and 1 h.p. for travelling) are fitted on the steel framework; they are of the totally enclosed type, series wound, rated at one hour and built in accordance with British Standard Specification No. 168. The hoisting motor is connected to the winch by means of an enclosed worm reduction gear. The travelling motor drives on to the road wheels by means of roller chains. Two controllers of the drum type are provided to operate the motors; they are fitted with spring return handles, so that they will always return to the "off" position when released. An automatic limit switch is provided to cut off the power when the lifter arrives at the upper travel limit.

Stacking bales at Frizinghall

Thermal Efficiencies. By A. Page, B.Sc., M.I.Mech.E.

Present power station practice and future possibilities

PRIOR to the advent of the grid an efficiency of about 21.51 per cent. (Barton) was sufficient to earn the blue ribbon in the Commissioner's Fuel Returns as compared with 27.95 per cent. for Barking B last year. Thus, in a period of eight years there has been an improvement of 6.4 per cent., but it would appear that the rate of improvement will yearly become smaller as the hyperbolic curve of efficiency against time approaches its asymptotic value.

It is questionable whether the grid can claim to have had any great influence on this point. Certainly it has meant greater efficiencies as in many cases it has meant lowering the turbine speed, and there is little, if any, difference in efficiency between a 20,000-kW 3,000 r.p.m. set and one of 50,000 kW at 1,500 r.p.m.

The only way in which the grid can have raised efficiencies is through improved load factors, but here again the difference in efficiency between a set at half and full load is only of the order of two per cent. A station such as Clarence Dock when it can operate under an annual load factor of 78.5 per cent., as it did last year, is certainly working under very favourable conditions, particularly with new plant. How much more are efficiencies likely to improve when conditions approach the ideal?

Condenser Losses

Fig. 1 is a typical heat-flow diagram of a modern generating plant, exclusive of boilers, with triple-stage feed-heating. It assumes full-load operation with moderate steam conditions. The diagram brings out forcibly the grave disadvantage of all steam plants using the present cycle, namely, the high percentage of heat rejected to the condenser. It is for this reason that bleeder heating has been adopted to re-introduce to the system some of the heat which would otherwise be lost. This is a fundamental point, namely, that if the cycle could be closed, even in part, it would immediately tend to bring about a new asymptotic level of efficiencies.

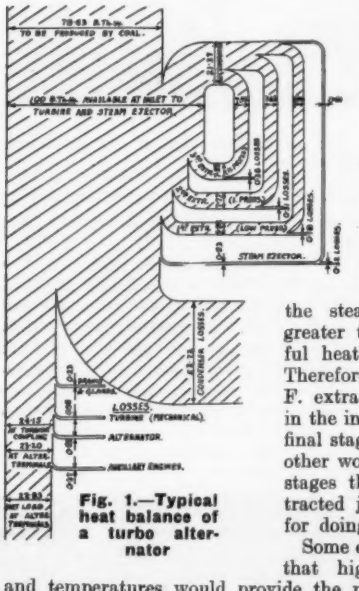

78·53 B.Th.Us. TO BE PRODUCED BY COAL.
100 B.Th.Us. AVAILABLE AT INLET TO TURBINE AND STEAM EJECTOR.
STEAM EJECTOR.
LOSSES. TURBINE (MECHANICAL).
ALTERNATOR.
AUXILIARY ENGINES.

Fig. 1.—Typical heat balance of a turbo alternator

A grave disadvantage of bleeder feed-heating is that the power obtainable from a fixed weight of steam decreases the farther the feed heating is carried. More important still is the property that the lower the stage in the turbine from which the steam is extracted, the greater the proportionate useful heat drop loss per stage. Therefore, more is lost per deg. F. extra feed-temperature rise in the initial stages than in the final stages of feed-heating. In other words in the preliminary stages the steam is being extracted just when its capacity for doing work is greatest.

Some engineers have thought that higher steam pressures and temperatures would provide the necessary solution, but any improvement in this respect is consequent on the divergence on the entropy chart between the line of total inlet temperature and the line of pressure for the exhaust condition; the increase in heat drop, assuming 850 deg. F. initial temperature and 29 in. Hg. vacuum between 140 and 1,400 lb. per sq. in. absolute, is approximately 22 per cent, all of which is not directly realisable as the internal efficiencies are less with higher pressures. Had nature or physics decreed that the foregoing lines should be parallel no gain would have been experienced by adopting increased pressures.

Further, at the upper pressure limits the temperature curve bends so that its inclination approaches that of the lower pressure line, which results in the percentage increase of the available heat drop falling progressively with increased pressure.

There is obviously an optimum steam pressure beyond which it is inadvisable to go, which pressure critics have suggested is 600 lb. per sq. in. However, even in that case over 50 per cent. of the heat must still be rejected to the condenser after taking into account the heating of the feed water to 350 deg. F.

To secure a better perspective of the present position, some time ago I made a comparison of various overall thermal efficiencies using as a basis a 50,000-h.p. turbo-generator with a total steam consumption of 319,000 lb. per hr., representing 6.38 lb. per h.p.-hr., the steam conditions being 567 lb. per sq. in. absolute, and 752 deg. F. and 28.55 in. Hg. vacuum

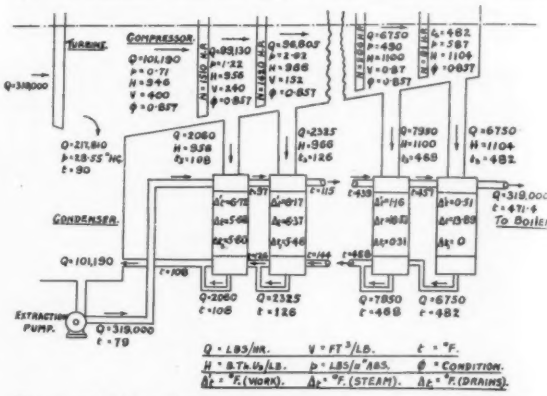

TURBINE.
COMPRESSOR.
CONDENSER.
EXTRACTION PUMP.
To BOILERS.
Q = LBS/HR. V = FT³/LB. t = °F.
H = B.Th.Us/LB. p = LBS/□" ABS. φ = CONDITION.
Δt = °F.(WORK). Δt = °F.(STEAM). Δt = °F.(DRAINS).

Fig. 2.—Feed-heating progressively by compression of steam from exhaust pressure

(bar. 30 in. Hg.). This would be equivalent to an internal thermodynamic efficiency of 87 per cent. for the turbine with 9 per cent. additional losses for bearings, glands, and alternator.

Stodola tables were employed throughout for the calculations. The first system analysed was a straight condensing set without feed-heating. This gave an efficiency, exclusive of boiler plant, of 30 per cent. The second system consisted of a multi-stage bleeder feed-heating set with twenty-two stages of heating, comprising twenty-one of 180 deg. F. rise each (assuming these tappings were available on the turbine), and one of 4.4 deg. F. to give a total theoretical feed temperature of 471.4 deg. F. with 11 deg. F. drop across the heater tubes. This represented the bleeder system driven to its extreme limit and the investigation gave a ratio of useful work to the heat added by the boilers of 33.6 per cent.

By way of a further check two other systems were analysed. In the first of these a direct attack was made on the exhaust and a system was evolved by which sufficient steam was extracted before the condenser and compressed to supply the same feed-heating system as in the second case mentioned above. The compressor was tapped after each wheel for feed-heating, the amount of steam under compression gradually diminishing. The drains of the feed-heaters were cascaded to the condenser from the higher stages.

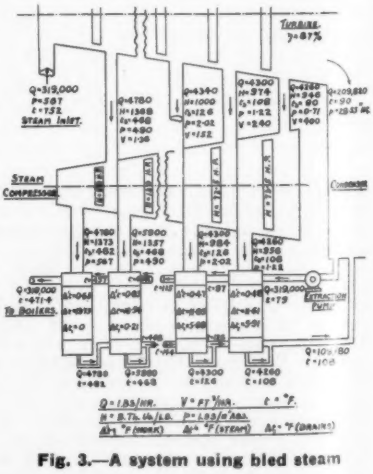


Fig. 3.—A system using bled steam

In order to secure the desired result it was necessary to extract 101,190 lb. per hr. of steam, which on compression absorbed 17,848 h.p., the compressor isothermal efficiency varying from 75 per cent. at the l.p. end to 34 per cent. at the h.p. end. The net result gave an efficiency of 27.3 per cent. of useful work to heat from the boilers, this being, as one would expect, less than with the straight condensing turbine, due to the irrecoverable compressor losses such as bearing friction, gland losses, and radiation.

Apart from this, the energy expended in securing added

sensible heat only would absorb almost 36 per cent. of the total available. Also, as the compressor was one-third the size of the turbine at its l.p. end, this would rule it out on the score of expense.

Bled-steam Compression

In the last system investigated, steam was compressed not from the exhaust branch but from a bleeder branch nearest the pressure required. Thereby, only one stage of compression for each heater was necessary and the size of the compressor, especially at the l.p. end, was substantially smaller. By this arrangement 34 per cent. of the exhaust steam going to the condenser was eliminated and re-introduced to feed while the total power absorbed by the compressor amounted to 2,116 h.p., or less than ½th the power expended in the previous example, giving an efficiency ratio of 32.7 per cent. While, therefore, the exhaust steam compression system is entirely out of the running as regards efficiency, bled-steam compression is almost three per cent. better than the straight condensing turbine, and only one per cent. behind multi-stage bleeder heating. Whether this bleeder compression system could in some cases be advantageously adopted is problematic, but the compressor would be relatively small and would absorb less than four per cent. of the total power obtainable.

The foregoing analysis indicates that we are now approaching the upper limit of thermal efficiencies possible by the present system. Taking a figure of 33 per cent. for the turbine room and allowing for the boiler efficiency and auxiliaries, the overall limit appears to be 29 to 30 per cent. under ideal conditions with super-pressures. Therefore, a radical departure from the present system of steam engineering must be introduced if any substantial advance is to be made, and the subject must be approached in an open-minded manner without the fetters of previous orthodoxy. Water as the working medium should be retained, if possible, owing to its cheapness and abundance; there is no doubt that the mercury-vapour turbine would have come more into prominence had mercury possessed these qualities. The main object is the elimination of condenser losses and the closing of the cycle. Once this is attained net efficiencies of 70 per cent. and over will be immediately possible, which might initiate a reversion to individual power plants in many industrial concerns.

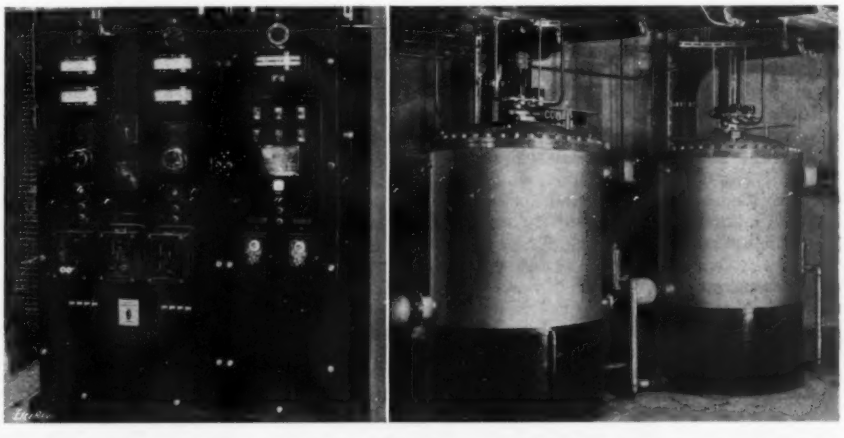
Remote Boiler Control

A unique arrangement at a Sloane Square stores

As its load is to a very large extent a lighting one the Chelsea Electricity Supply Co., Ltd., experiences severe peaks during foggy weather. When, therefore, Messrs. Peter Jones, the well-known drapers and house furnishers of Sloane Square, applied for electricity to operate two 750-kW electrode boilers for the heating and hot-water service in their rebuilt premises, the supply company, with its existing generating arrangements, was rather chary of acceding to the request.

Messrs. Bastian & Allen, Ltd., makers of the electrode boilers, have, however, come to the rescue and have solved the problem satisfactorily by the installation of duplicate control boards, one in the boiler-room itself and the other in the supply company's sub-station close by in Cadogan Gardens. By this arrangement the sub-station can in emergencies cut off the supply completely or pass on just as much energy as it can spare. A flat rate of 0.25d. per kWh is charged for the first million kWh a year and 0.175d. above that quantity. Practical tests have shown that the restricted supply in no way affects the efficient operation of the boilers.

The boiler control panels themselves are very neat and compact, and in a very small space incorporate all the load and thermostat controls, relays, meters and switches required. A flow control automatically reduces the load when the maximum temperature in the storage tanks is nearly reached and no matter in what position the load control handle is left, no harm will result, as provision has been made for the minimum load to come on initially and rise gradually to the figure indicated by the wattmeter. Adjoining the control panel in the boiler-room is a remote temperature recorder (Foster Instrument Co.) which indicates the temperature at twelve selected parts of the building.



The boiler control panel and remote temperature recorder at the rebuilt premises of Messrs. Peter Jones, Sloane Square. Right: The two 750-kW Bastian & Allen electrode boilers

Provision of Extensions

The electricity supply for the boilers is received from the Chelsea Company's sub-station at 6,000 V, 50 cycles, three phase, and is stepped down to 415 V by two 750-kVA Johnson & Phillips transformers with star-delta connections. The Ferguson, Pailin h.p. switchgear employed embodies overload relays and all other usual safety devices. A Westinghouse rectifier provides the d.c. required for operating the magnetic valves of the boilers.

When Messrs. Peter Jones have completed the rebuilding of their premises in about five years' time the existing heating installation will be inadequate so that space has been left for a third boiler and another transformer.

The heating and hot-water service installations and the air-conditioning plant themselves were installed by Messrs. James Combe & Son, Ltd., and as they are almost identical with those at the Lansdowne House Club described in our issue of June 21st last there is no need for us to describe them in detail. For the hot-water service two 2,000-gal. storage calorifiers were used, four 8,000-gal. thermal-storage cylinders containing the water for the heating installation. Bull "Supersilent" motors of 3- and 1½-h.p. operate the primary and secondary pumps, the 12-h.p. fan for the ventilating system being controlled by an Igranic starter. Throughout the building the air is kept pure and at a comfortable temperature and humidity by the use of an air-washer (James Keith and Blackman Co., Ltd.), and a row of push-buttons (Igranic) control the ventilating and extraction fans as well as the pumps.

Messrs. John Lewis's Works Department, which is carrying out the electrical work in connection with the rebuilding scheme under the direction of Mr. J. W. Woolley, chief electrical engineer, has taken the opportunity offered by the alterations to change over from d.c. to a.c. The lighting supply is at present only a temporary one and is controlled by a Drake & Gorham circuit-breaker, with M.E.M. "Glasgow Rex" iron-clad switchgear.

When the alterations to the premises are completed there will be a lighting load of 800 kW and a power load for the lifts and small motors of 350 kW; and four additional circuit-breakers of the same type will be installed, together with Drake & Gorham new fabricated switchboards, incorporating English Electric high rupturing capacity fuses. Callender's cable, Crabtree switches and "M.K." 5- and 15-A interlocking switchplugs are being used throughout the building.

A great deal of trouble is being taken in selecting the best type of lighting fitting for general use, and a large basement room has been equipped with all types and makes in order that a comparison may be made before coming to a definite decision. Among other items of electrical interest in the stores is a Waygood-Otis lift, which is used for conveying from street level to the basement the two G.V. electric vehicles which the company is finding very useful.

Lubricants for Power Plant. By W. E. Gooday

Their selection and use

RECENT developments in power generation have increased the variety of plant and machinery, and new problems of lubrication have arisen. The technique does not rest at the choice of oil or grease; further steps include consideration of its application, handling, storage and reconditioning (where the circumstances of use justify this).

The selection of lubricants may be made by: (a) manufacturers of plant or machinery; (b) suppliers of lubricants; or (c) users of lubricants. The manufacturer of a machine is unlikely to recommend or endorse the use of an unsuitable lubricating oil or grease for its lubrication, but he does not necessarily recommend the products that show the best all-round value to the user. He often transfers responsibility for the choice of oil to the supplier so that method (a) becomes virtually method (b).

The supplier can call upon a wide experience in making his selection and generally his choice is sound technically, but it will obviously favour his own rather than his customer's interests in relation to price. The service provided by reputable suppliers has much to recommend it, and is paid for in the price charged to the user, but the user may not require to avail himself of the service. Again, conflicting recommendations by different suppliers of lubricants tend to embarrass the buyer and to militate against confidence in quality as well as in price.

Choice by the User

Where the user is in a position to define his requirements by consideration of the plant to be lubricated and by drafting specifications for the lubricants he needs, he can compare the competitive tenders of several suppliers on equitable bases. Certain of the largest undertakings in Great Britain have been able to adopt this method of buying through their own technicians. In other organisations where the permanent employment of the appropriate technical skill is impracticable, collaboration with a specialist acting solely in the users' interest can achieve comparable economies. The consultant should be engaged to prepare specifications and to co-operate in drawing up a complete scheme of lubrication.

The methods of selection under (c), evoked by an appreciation of the significance of efficient lubrication and care for its economical attainment, constitute but the first step in the requisite engineering technique. In preparing a lubrication scheme, the number of oils and greases should be reduced to the minimum in order to simplify storage arrangements and to obviate error, but, allowing for exceptional circumstances, this should not be carried to the extreme where, say, an air-compressor or a turbine oil is wastefully applied by hand to rough machinery. The technical factors that must be taken into account in selecting a lubricating oil vary with the purpose in view, but an outline of the needs of air-compressor cylinders and steam turbines may be cited as examples.

With air-compressors, to achieve the minimum fluid friction, reducing waste of power, an oil that is not unnecessarily viscous is required, while piston seal, preventing loss of energy through leakage of compressed air past piston rings and cylinder walls, calls for an oil of adequate viscosity. Homogeneity indicates an oil of a restricted range of hydrocarbons (not an indiscriminate blend of extremes) and contributes to physical as well as to chemical stability which offers resistance to changes in composition, due to oxidation or to polymerisation. The minimum tendency to carbonisation ensures that the oil, even under oxidising conditions and in contact with impurities in the air intake, will not too readily provide the source of carbon with which those impurities accumulate to form undesirable deposits that interfere with valve operation. Even so, it must be remembered that over-feeding of the best lubricant may be as productive of deposits as is the use of inferior oils.

Turbine Oils

For steam turbines minimum fluid friction is a factor that must be combined with an adequate film-forming property to provide lubrication at starting and stopping. During running, the oil serves as a cooling medium rather than as a lubricant, except for the governor gear. Broadly, there exists a preference in steam turbine lubrication for the least viscous lubricants, and such oils offer better cooling properties. Chemical stability has constantly been the aim in the manufacture of turbine oils. Resistance to oxidation and internal chemical change are necessary to reduce the sludge and emulsion-forming effects of these reactions.

The characteristics implied in the foregoing have to be balanced with mechanical considerations of size, type and operating conditions of the machine to be lubricated, bearing in mind the existing methods of application, unless these can be changed with advantage.

Apart from the factors enumerated distribution of oil to cylinders of air-compressors and of i.c. engines must be achieved satisfactorily and sparingly if good results are to be obtained with the best oil.

Little more than a passing reference can be made to the technical considerations that arise during the use of lubricating oils. The quantitatively more important oils in the circulatory systems of steam turbines provide the best example. The influences affecting the life of such oils may be enumerated as: (1) air, (2) temperature, (3) turbulence, (4) water, and (5) impurities.

Aeration to be Avoided

The oxygen of the air combines with the less stable constituents of the oil, forming oxidation products that facilitate the emulsification of the lubricant with any water that gains access to the system. Further oxidation accompanied by polymerisation may produce semi-solid insoluble deposits or sludges that must be removed from the oil (preferably at its coolest state) to obviate their accumulation and interference with heat transfer in the oil coolers and elsewhere. Aeration of lubricating oil in a circulatory system should thus be avoided where possible.

Temperature is an accelerator of chemical change, but is not as potent in turbine lubrication effected at modest temperatures, usually under 180 deg. F., as it is in the lubrication of i.c. engines where cylinder oil is subjected to the temperature of combustion.

Turbulence is controlled largely by the original design of the oil system and may be reduced by the avoidance of sharp bends in oil pipes and maintenance of an ample volume of oil in the system; the attainment of non-turbulent flow reduces aeration.

Whereas in steam-cylinder lubrication readiness of the cylinder oil to emulsify with moisture may be a necessary characteristic and is provided for by adding a small quantity of fatty oil (*e.g.*, lard oil or tallow oil) to the lubricant, in a circulatory system emulsions are to be avoided. This is achieved by preventing the accumulation of water in the system and by using a type of oil which, when maintained in good condition, possesses a high resistance to emulsification.

Most systems are subject to access of water from steam glands or possibly from leaky cooler tubes. Water, *per se*, is an intruder and may bring with it soluble ingredients that act as emulsifying agents or react directly or catalytically with the less stable hydrocarbons of the oil.

Most metals act as catalysts in the processes of oil decomposition, copper being one of the most potent, but oxides of iron, lead and zinc and of copper will combine with oxidised oil to form metallic soaps, traces of which under critical conditions are active emulsifying agents. The normally remote possibility of alkali being carried over by priming cannot be ignored as a potential source of contamination.

Normal practice includes the regular withdrawal of any appreciable quantities of water that may find their way into such systems, but the further removal of traces of other adventitious impurities will usually repay the care taken. Centrifuges designed for this purpose have now become normal to land and marine installations. Judicious choice in the first instance and careful treatment in use may extend the durability of turbine oils to many years of satisfactory service.

Economy by Reconditioning

The reconditioning of i.c.-cylinder oils presents a field that is productive of immediate and considerable economy. Here the most persistent contamination is the result of partial combustion and particles of carbon are so finely divided in the used oil that it is usually described as a colloidal suspension. This carbon is responsible for the black appearance of used oils; it will not respond to ordinary filtration or to centrifugal treatment, but can be separated by a streamline filter. Unless this carbon be removed the oil should not be regarded as serviceable for continued use as cylinder oil.

Although the first object to be sought from a review of lubrication and lubricants may be immediate economy obtainable from technically controlled purchase, equally valuable and continuous returns are afforded by: elimination of faulty lubrication; reduction of avoidable friction; reduction of wear and tear; and reduction in oil consumption and oiling time.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Electricity and Steam

With reference to the paragraph "Electricity and Steam" in your issue of July 26th, mention is made of a thermal efficiency of 60 per cent. for a thermal electric station. I have criticised elsewhere a somewhat similar figure given by Mr. A. Monkhouse for the Berenski Chemical Works in Russia. I maintain that the term "thermal efficiency" is meaningless and misleading. There is only one unequivocal criterion of efficiency and that is the thermodynamical one. Monsieur Darriens has demonstrated the simplicity of its solution for any combination of cycles. A heat unit has no value as such, and, while 60 per cent. may inform one that 40 per cent. has already been rejected to the sink, it does not say what proportion of that 60 per cent. is doomed to the same fate at the pass-out branch of the turbine.

B. LLOYD PRICE, A.M.I.E.E.

Newport (Mon.), *August 3rd.*

Voltage Variations

With reference to the letter of Mr. Stubbings in your issue of July 19th, I venture to disagree with the views expressed. The basis of Mr. Stubbings's opposition to voltage regulation appears to be that control of the supply voltage is providing the consumer with a service which he does not want and/or some service which he does not appreciate and, finally, that such control equipment is rarely, if ever, justifiable economically.

While on paper the needs and resultant advantages of regulating equipment do not appear favourably as analysed by Mr. Stubbings, yet operating experience proves that a still much wider use of regulating equipment is desirable from both the economic and service aspects of electricity supply.

The generalisations made by Mr. Stubbings strengthen the manufacturers' opinion that voltage regulation should and must be considered in relation to the network, and not from the isolated viewpoint of the improvement of the voltage at one particular point.

There are certain other points I would like to deal with, and I hope to have the opportunity of doing this on my return to England. H. W. BISKEBORN.

Zurich, *August 4th.*

Battery Eliminators for Telephony

I noticed in your issue of July 26th an article advocating eliminating batteries from telephony. The article says that breakdown of supply is so rare nowadays that direct mains power for telephones is practicable. This may be so, but at no time are telephones so important as when light and power are cut off. No, even if it is technically and economically possible, please leave the telephone safe in emergency.

Cartmel, Lancs, *August 5th.* E. M. KERR.

The Skilled Man's Plaint

A letter by Mr. Alex Milne published in your issue of March 15th caused me some surprise.

According to your correspondent, any person can engage in wiring; this seems hardly fair to the man who is prepared to spend time and money in passing an examination, which it is necessary for him to do in New Zealand, before he can engage in electrical wiring.

A lad starting as an apprentice has to spend three years at the trade before he can sit for an examination (practice and theory). An examination conducted by the Public Works Department of the New Zealand Government is held every three months.

A student may not pass in both subjects; should he fail in one, say the theory, he will not be issued with a licence until he has passed in both subjects. There is practically no limit to the times he may sit for the examination, but a small fee has to be paid each time. Upon gaining his licence he still has to serve two years at the trade to complete his apprenticeship of five years. You will no doubt realise that this not only ensures a high standard of workmanship, but excludes any person not qualified from carrying out any electrical work unless he is accompanied by a licensed wireman.

Every supply authority in New Zealand is compelled to employ registered inspectors whose duty it is to examine and pass each and every installation whether new or additional. The regulations governing electrical work in this country are also drawn up by the Public Works Department of the Government, thus ensuring a standard of regulations which must apply throughout New Zealand. Conduit wiring is standard practice, the earthed neutral being used. W. RAWLENCE,

Dunedin, N.Z., *June 22nd.* Registered Wireman, B.1968.

Salaries and Grading

I quite appreciate the views expressed by Mr. D. Shipton Wood in his article in your issue of August 2nd. But surely the plight of the canvasser, the development assistant and the showroom attendant warrants a graded scale of salaries.

One hears every day of experienced development assistants being required at a salary of 30s. per week, plus a small commission on orders secured, and even of assistants to take complete charge of showrooms at the princely salary of £150 per annum!

I, for one, would like to know of an association that we could join to protect our salaries, conditions of employment, &c. If there is no such association in existence I should like to hear the views of my colleagues in other supply undertakings upon this question. E. SALMON.

Ewell, Surrey, *August 6th.*

The revised schedule has arrived and with it improvements in salary for some, but grouses and queries from others. One of the most unfortunate things in it is the old anomaly of grading definition. Without some standard basic scale, how can we define the grade in which any individual should be placed? Of the grades only two are at present defined, namely, "shift charge engineer" and "switch board attendant."

Some persons have suggested the placing of the charge engineer in a higher grade, and this possibly may be a solution to enable the b.h. engineer or combustion engineer and assistant charge engineer to be fitted in. In making this alteration there is a possibility of a clash with many of the assistant engineers in other departments.

This state of affairs would cause a certain amount of dissatisfaction, yet the charge engineer's responsibilities are quite as heavy as those of many of the assistants. He is in charge, and solely so, for at least 14 hours out of 24. It is he who is required to make a decision in the event of any trouble. It may be argued that this holds good in the larger stations only, but are we not now reaching the point at which only large stations are likely to exist?

What is the position of a charge engineer in a station which has ceased to extend its plant because of the grid? Had the grid not been in operation, extensions would have been necessary, resulting in a re-classification of the station and an increase in salary for the staff. Admittedly, with grid supply there are no boilers or machines to look after, but nevertheless the load is on the station network and comes in and goes out of the station bus-bars This becomes the charge engineer's responsibility. Will these men view the grid as a beneficial proposition under the present circumstances?

A view of Marlow Bridge across the Thames, illuminated with "Osram" lamps by the Western Electricity Supply Co., Ltd.

Do the grid controllers come under any classification and grade? "M" seems the only class available—with grades 7 or 8? It all seems so hopeless to try to solve.

Two good points stand out in the revised edition. First, the increase to class "M" (over 250,000 kW), but even as this comes into operation undertakings are talking of 300,000 kW plants. For some, therefore, in a space of another two years, this schedule will become obsolete. Secondly, the provision of annual increments will probably be one of the most generally accepted good things. But it does not necessarily cover the case of the relief charge engineer who in some undertakings is paid on a lower basis than the other charge engineers because he happens to be on shift only a portion of his 48 hours. Why not increments for these men up to the full grade, instead of their having to wait until a full-time engineer leaves or dies?

In several cases of vacancies advertised in the technical Press recently no grade has been stated, only a salary. How is the average engineer to decide to which grade a job should be allocated when he has nothing definite to refer to? This form of advertisement may not be a deliberate attempt to avoid payment under E.P.E.A. conditions, but just a way of getting over a very controversial subject. Why not an authentic list of all undertakings and their respective classification for reference purposes?

Possibly I have stressed the point of the charge engineer too much, but after all the E.P.E.A. was formed by charge engineers to raise their status. Although I agree with Mr. Shipton Wood in practically every case he outlines, I do not entirely agree regarding the charge engineer and the impossibility of grading. In stations of equal capacity a charge engineer's duties should not vary. He should be, and is, in charge of the whole of the shift operating side of the station. There must be one engineer on shift to collaborate with and supervise all departments after the chief leaves.

Sort out the grades by all means, but has not the E.P.E.A. tried and failed? It must continue the good work, but how long will it be before we get these anomalies cleared up?

Men engaged in the industry *do* refrain from membership of the E.P.E.A. While their grade is not defined and they think they have a good salary they will keep their annual "subs" in their pockets. Define their job and grade them definitely, then perhaps they will join, particularly if it is shown that they are not receiving all they should for their jobs. This is undoubtedly a poor spirit, but one which exists even among technical staffs. POWER ENGINEER.

London, *August 5th.*

A Rural Problem

The following experience recently occurred in a nearby village when I was out one day intent on developing the load in one of our districts. Observing a very rustic gentleman of mature years down the village street, I tackled him on the question of lighting his own house, having previously met him on two or three visits to a farm which we had supplied.

The conversation was something like this: "Now we've got the village supplied I expect you will be having your own house wired?" A patient smile crossed his face as he said, "No, we don't want much light." Thinking he had the long summer evenings in mind, I said, "Of course you may not need much light at this time of the year, but when the winter comes you'll need it." "No," he replied, "We don't want much light." "But," I said, "you're bound to have some kind of light, either oil lamps or electric light." "No," he said, "we shan't want any light." "Well," I said, "whatever time do you go to bed?" and with the same patient smile he replied, "In the winter time me and missus is generally in bed between half past six and seven."

Diss, Norfolk, *August 12th.* LESLIE HOULDNIDGE.

Forms and Ceremonies

As a brother in adversity, I welcome "Osmo's" letter bearing this heading in your last issue. No other industry is compelled to make returns giving so much information as are demanded by the Electricity Commissioners. Special labour with heated brow is required if one's work is to keep up to date. Analysis of this and that is a job of patience which leaves little time for the work for which one is really supposed to be paid by the undertaking. Working for a supply undertaking continuously changing its rates adds to the difficulty of preparing these returns.

Reference should also be made to the application forms which scare prospective consumers into thinking gas is better. The industry is tamed by the Electricity Commissioners and other powers, but the reins need loosening to obtain better results. G. A. SIMMONS.

Crawley, Sussex, *August 12th.*

The I.E.E. Regulations

Mr. Day has asked me for the authority for my statement that the Electricity Commissioners have power to make the I.E.E. Wiring Regulations enforceable. The answer is to be found in the Electricity (Supply) Acts. Section 6 of the 1882 Act gives the Electricity Commissioners power to make regulations for securing the safety of the public from personal injury or from fire or otherwise, and, when such regulations are made, authorised undertakers are subject to them. If, therefore, the Electricity Commissioners are of the opinion that in the interests of safety the Wiring Regulations must be complied with, they can adopt them and make them enforceable. So far they have not done so, although they have accorded to them a measure of recognition by enabling authorised undertakers to accept them as a standard for consumers' installations, without making the standard an absolute one, from which no departure is permissible.

The Wiring Regulations in themselves have no statutory force as they are made by a body that has not been created by statute and which possesses no statutory powers. They can be made enforceable if adopted as bylaws, but as such bylaws must be confirmed by the Electricity Commissioners, and as the latter have recently indicated that they cannot see their way to confirm such bylaws when made, this method is not at present available to electricity authorities. Mr. Day will find further information on pages 78 and 79 of the fourteenth annual report of the Electricity Commissioners.

Manchester, *August 9th.* J. W. THOMAS.

According to a letter from Mr. J. W. Thomas in the correspondence columns of your August 2nd issue, I observe that the power of enforcing the I.E.E. regulations rests with the Electricity Commissioners. This is refreshing news because I previously understood that while the regulations were not enforceable they had been substantially adopted by most electricians and manufacturers due to their recognition by insurance companies.

I suggest that the legal enforcement of the regulations is long overdue. Surely the various electrical manufacturing concerns are not so apathetic, or antagonistic to each other, that they cannot combine immediately to force the Commissioners to place the I.E.E. rules on a proper footing? The question of settling anomalies in the rules is a small one compared with that of preventing the dumping of shoddy and highly dangerous domestic appliances on the English market. Nobody can convince me that local electricity department rules are sufficient to safeguard users. Cheap imported electrical accessories can be bought anywhere.

Surely the industry is not going to act on the strength of numerous fatalities—equivalent to locking the stable door after the horse has bolted.

In one way, a legal basis for approved I.E.E. rules may lessen unfair competition and partially prevent foreign dumping, but I by no means suggest that attempts in other directions to safeguard our industry should be abandoned.

Manchester, *August 7th.* G. V. COLLE.

I agree with Mr. C. L. Arnold that there is no advantage to be gained by the use of double-pole switches on sockets, a single pole switch (if fitted in the "live" wire) being equally safe. From the point of view of safety, however, I am of the opinion that neither single nor double-pole switches answer the purpose unless they are of the interlocked type.

Drastic competition has been responsible for many electrical iniquities and I have no doubt that Mr. Arnold's firm would prefer to manufacture only three-pin sockets and plugs with interlocked switches if the necessary backing was forthcoming.

Glasgow, *August 10th.* A. MILNE.

Whether the Commissioners have the powers to enforce the I.E.E. Regulations or not is a matter with which I am not sufficiently acquainted to discuss, but I do question whether the industry will derive any good from enforcement.

Who will be responsible for seeing that the rules are complied with? Complete enforcement means not only inspection at the time of completion, but periodically afterwards. Most distributing authorities would be reluctant to keep extra staff for the job, even if they were able to demand admittance to consumers' premises for the purpose. The question of an inspector's right of entry has already been debated in the House of Commons.

My experience as an official of a supply company whose duties include the inspection of installation work has taught me that an installation inspector is regarded by contractors (and in some cases by consumers themselves) as a person to be discouraged in every possible way. If the shoddy, irresponsible contractor can get a defective installation connected he regards it as a great achievement.

Nor is that all, for I think that fully 75 per cent. of other-

wise sound installations are spoilt and rendered unsafe by later alterations made by these shoddy contractors. Only to-day I came across a perfectly sound screwed tubing job wired for a maximum of 60 A being cut about and unbonded twin lead being added, increasing the loading by a further six 15-A points, including one *two-pin* socket in the bathroom! What can the enforcement of the I.E.E. Regulations do to stop this sort of thing? While unqualified contractors and uninformed if enthusiatic amateurs are allowed to tamper with installations, all the regulations in the world will be ineffective.

The only sound solution is to make it illegal for any but a properly authorised electrician to handle installation work. Registration should be made compulsory, not only for contractors, but for wiremen as well. Each installation should be labelled with the contractor's registered number, and distributing authorities should be held responsible for reporting defective workmanship to an authorised body. If the wireman or contractor concerned could not give a reasonable explanation of the defect, then his registration should be cancelled. From the economic point of view the result would probably be bad at first, but conditions would soon right themselves and the whole industry would benefit ultimately.

By this means the shoddy contractor and his work would be eliminated and unfair competition would be wiped out. Moreover, the responsibility for a good, sound installation complying in every respect with the regulations would rest not upon a company or municipal supply authority, but upon those whose job it really is—the wireman or contractor.

London, W.12, *August 8th*. G. A. EXETER.

An All-electric Swimming Pool

THE new all-electric open-air swimming pool of the Croydon Corporation at Purley Way, which was officially opened by the Mayor, Ald. J. Trumble, on July 20th, has proved an immediate success. During the first three weeks of its existence 75,000 people paid for admission—an average of 3,575 per day. The site, occupying an area of 4¼ acres, has been excavated to form a slightly sunken arena with the pool in the centre, surrounded by flower beds, grass lawns and shingle sun-bathing beaches.

The pool is 200 ft. long and 70 ft. wide at each end. Rectangular bays, 60 ft. wide, have been constructed in each of the longer sides, giving an overall width at the centre of 100 ft. The depth varies from 3 ft. 6 in. at each end to 6 ft. 6 in. at the centre, with a 15 ft. deep diving pool in one of the bays. The whole of the electrical equipment, which is of an unusually comprehensive character and has undoubtedly had much to do with the attractiveness of the bath, has been carried out to the specification and instructions of Mr. F. N. Rendell-Baker, borough electrical engineer.

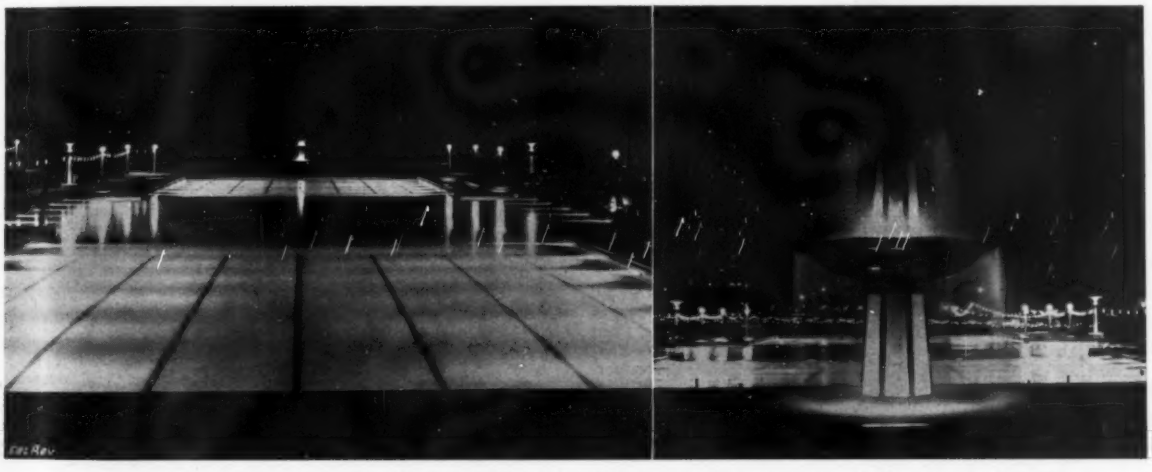
The Electrode Boiler

Plant has been installed for both warming and sterilising the water electrically, warming being effected by means of an electrode boiler and sterilisation by ozone produced from apparatus operating on the principle of the silent electrical discharge. The installation at Croydon is considered to be the first in which electricity has been used for the dual purpose in such a manner. The electrode boiler was constructed by Messrs. Sulzer Bros. and is fed from the Corporation's 6,600 V, 50 cycle, three-phase mains. It has a capacity of 750 kW with load regulation down to 250 kW. The apparatus is automatic in operation, with thermostat control for maintaining the temperature of the water and with regulating apparatus for reducing the load on the mains when starting up and shutting down. The hot water from the boiler is circulated through a heat exchanger by means of a pump coupled direct to a 5-h.p. motor.

Filtration is effected by the water passing through rapid filtration plant manufactured by the Turn Over Filter Co., power for the main circulating pump being provided by a 30-h.p., 400-V, three-phase motor. After passing through the filtration plant, which is capable of turning over the total quantity of water contained in the pool (650,000 gallons) once in each complete period of six hours, water is returned to the pool *via* the heat exchanger in which the transfer of heat produced by the electrode boiler is effected. For sterilisation of the water Messrs. Bruce H. Auld & Company's S.A. ozone generators have been installed. These consist of banks of quartz dielectric condenser tubes on which a pressure of 7,000 to 11,000 V is imposed. Ozone is formed in the apparatus by subjecting air passing through it to the action of an electrical discharge, the ozone produced then being fed into the filtered water delivery main and also by means of a blower direct into the pool through a system of small bore delivery tubes terminating in nozzles distributed over the floor of the bath.

Attractive Lighting

The pool is open till 11 o'clock each evening and after dusk a very attractive effect is produced by under-water lighting. Thirty-six portholes are built into the sides of the bath, each glazed with an 18-in. square of ½-in. plate glass and containing a 1,000-W lamp backed by stainless steel focusing-type reflectors supplied by Holophane, Ltd. Cascades 12 ft. high, constructed in polished green artificial stone, are provided at each end of the pool. The central stems of these consist of glass panels housing lamps and colour screens by means of which colour changing effects are produced. On the terrace opposite the main entrance is a G.E.C. ornamental fountain which also incorporates colour changing effects.



The new open-air baths at Croydon showing (left) the under-water lighting and one of the aerator fountains

Cast "Snowcrete" lamp standards capped with ornamental lanterns surround the pool and are used for general lighting. Several of these standards are floodlighted from projectors concealed in wells at their bases, colour changing effects again being obtained. The colour changing equipment on the cascades and lamp standards, the ornamental "Lily" lighting fittings on the latter and the 10-kW motor-driven three-colour dimmer required to produce the colour changes, have been supplied by Holophane, Ltd. To complete the scheme of illuminations, hundreds of coloured fairy lamps are arranged in festoons round the lawns and beaches attached to the pool.

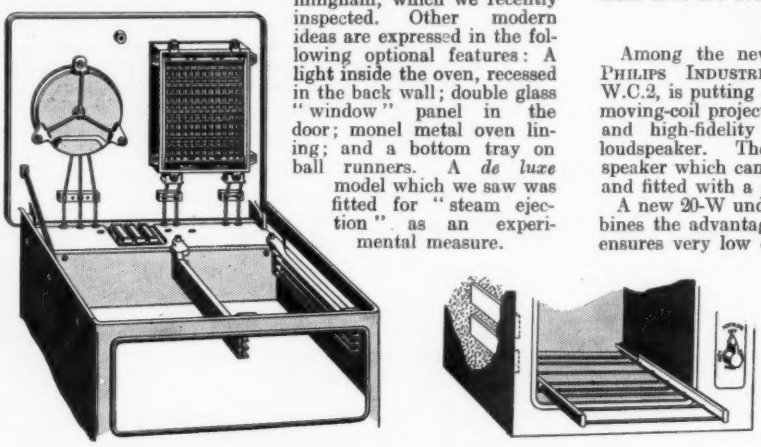
Public address and entertainment equipment by Messrs. Philips is installed and includes a radio gramophone with provision for the automatic changing of records, a microphone and a battery of loudspeakers mounted on the roof of the main building. Light refreshments are obtainable at an electrically equipped café in the pool grounds.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Modern Cookers

Automatic oven temperature control and "exterior" oven elements are standard features of a cooker produced by MESSRS. ALBERT PHILLIPS, LTD., Excelsior Works, Eyre Street, Birmingham, which we recently inspected. Other modern ideas are expressed in the following optional features: A light inside the oven, recessed in the back wall; double glass "window" panel in the door; monel metal oven lining; and a bottom tray on ball runners. A *de luxe* model which we saw was fitted for "steam ejection" as an experimental measure.



Constructional drawings of the large "Crescent" cooker

Twelve low-loaded mica-wound elements in nickel alloy sheaths slide from the back of the oven into pockets welded to the outside of the oven lining. Alternatively, plug-in elements in nickel-steel alloy casings are available for internal heating for either top or bottom, side or side and bottom heating. The 13-in. cube oven is loaded at 2,000 W. On the hob there are an 8-in. dia., 1,800-W solid plate and a 2,000-W or 1,800-W boiler-griller with its element sections "interlaced" so as to give even heat over the whole area on all three switchings. The overall dimensions are 37 in. high, 21 in. wide and 20 in. deep.

An "Intermediate Crescent" cooker with 400-W bottom booster

This cooker is the largest of a range of four "Crescent" models which include the "Maisonette" with a 2,000-W boiler-griller which also serves for top oven heating and bottom oven and "exterior" elements loaded at 1,000 W with three-heat control; an "Intermediate" cooker with a 2,000-W boiler-griller and a 400-W "exterior" element with single-heat control; and a breakfast cooker with a 2,000-W boiler-griller only. The three smaller cookers are of similar construction, each with a sheet-metal body and a cast hob, and the large unit is made of cast-iron and steel plates. The "Intermediate" model has a warming cupboard under the oven. In consequence the small heater at the oven bottom has been left uninsulated in respect of heating, but the oven is otherwise lagged. A switch-controlled plug is provided.

Larger "Coal Effect" Fires

The main ideas behind the design of the two fires, "Glenberry" and "Villaberry" introduced for the coming season by MESSRS. BERRY'S ELECTRIC, LTD., 85-86, Newman Street, Oxford Street, London, W.1, are a larger "coal effect" portion and increased overall dimensions, together with price reductions. Mr. Ray Berry tells us that there is a tendency in some quarters at any rate, for consumers to favour fires with larger bodies irrespective of loadings, and that the "Villaberry" represents the first introduction of "Magicoal Plus" fuel in a fire costing less than £3. This unit, which is 20½ in. wide, 22½ in. high and 8½ in. deep, is made in one size only and has ordinary fireclay and spiral bar-type elements arranged horizontally above the "coal fire." The centre front of the one-piece sheet-metal body is of inward V-shape, so that the elements "bridge" the fire, and the result is, we think, a particularly good flue effect, with the "flames" disappearing upward behind the elements. The projecting fireplace and the hobs are of sheet metal and the top is of cast metal. The "Glenberry" has a flat, rather severe, sheet-metal body, with relief at the edges and with reflector radiators recessed at the back of, and above, the fire. The projecting hobs of the fire unit are of cast metal. The model is made in 2-kW and 3-kW sizes, the smaller one having two separately reflectored rod-type elements arranged horizontally, while the large one has three similar elements, but vertically disposed. Both fires are available in oxidised-copper and silver finishes.

Amplifying Equipment

Among the new range of amplifying equipments which PHILIPS INDUSTRIAL, 145, Charing Cross Road, London, W.C.2, is putting on the market are a 6-W permanent-magnet moving-coil projection loudspeaker and a 10-W high-sensitivity and high-fidelity permanent-magnet moving-coil projection loudspeaker. There is also a 20-W permanent-magnet loudspeaker which can be obtained built into a weatherproof case, and fitted with a directional flare or on a baffle.

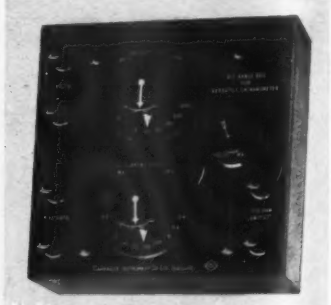
A new 20-W undistorted output "Maxiwatt" amplifier combines the advantages of class A and class B amplification. It ensures very low consumption, making the amplifier particularly suitable for mobile purposes, it being also very light and compact.

A Soldering Paste

BRITISH INSULATED CABLES, LTD, Prescot, have put on the market a soldering paste, known as "Jaydalene," which is claimed to be non-corrosive. It is of such a consistency that it can be applied to the work in the smallest quantity necessary for the particular operation, and does not drop or run unduly, being, therefore, clean and economical in use. The new paste has a distinctive green colour which, however, bears no relation to its characteristics as a flux.

Galvanometer Accessories

The CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Place, S.W.1, now produces a d.c. voltage and current range box for use with a versatile galvanometer, to cover measurements from 2 μA to 12 A and 1 mV to 1,200 V. Two switches give ten ranges of current and nine of voltage; the instrument can be switched over to either without disconnecting the supply leads.

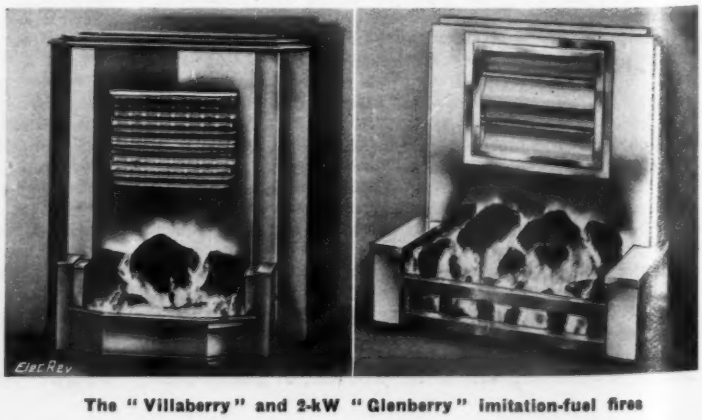


A Cambridge voltage and current range box

An a.c. voltage and current range box generally similar to the d.c. model covers ranges of from 10 μA to 12 A and 10 mV to 1,200 V at supply and audio frequencies, using a Westinghouse copper-oxide rectifier and current transformer. All ranges are entirely self-contained and are controlled by a single range switch. The overall accuracy when using the uniformly divided scale 0-120 on the versatile galvanometer is approximately 1 per cent. of full-scale deflection when using a sine-wave supply.

Imitation Coal Fires

We are informed by MESSRS. W. T. FRENCH & SON, Mysto Works, Browning Street, Ladywood, Birmingham, 16, that they are introducing a range of electric fires which incorporate a new type of imitation coal made of a translucent synthetic material giving a realistic effect. There are three different designs of fire, the "Regal," the "Mystoheat" and the "Majestic."



The "Villaberry" and 2-kW "Glenberry" imitation-fuel fires

Japan's Electrical Industry

Production and overseas trade

DETAILED trade returns of Japan for 1934 showing imports and exports according to countries of origin and destination have recently been issued in Tokyo. From these the appended figures relating to the trade in electrical machinery and apparatus have been extracted, and notes of increases or decreases compared with 1933 added. (Yen= approx. 2s.).

It will be seen that, apart from a few minor items, imports decreased. They are on the whole less than half the level of five years previously, which is not surprising in view of the advance that has taken place in local manufacture.

In the June circular of the Mitsubishi Research Bureau there was a detailed survey of the machinery manufacturing industry in Japan, the electrical branch of which has shown remarkable progress since the War. This movement has been encouraged by the increased demand for power arising from the general economic recovery of the country. As an example the circular cites the 53,000-kW turbo-generator sets for the Amagasaki power station of the Kwansai Kyodo Karyoku Co. Progress is also recorded in the production of radio appliances, telephone and telegraph equipment generally, fans, small motors, dynamos for automobiles, electric welders, electric furnaces and resistance wires for electric heaters.

The progress of manufacture during recent years—so far as statistics are available—is shown in the following table:—

	1931 Yen (thous.)	1932 Yen (thous.)	1933 Yen (thous).
Dynamos	4,866	4,638	7,721
Electric motors	10,369	9,886	21,554
Transformers	5,884	6,618	9,977
Insulated wires	21,442	26,329	30,488
Cables	10,421	10,190	17,850
Radio appliances	9,582	11,552	19,298
Other telegraph and telephone appliances	6,284	7,034	7,697
Batteries	7,581	8,598	11,457
Unspecified electrical machinery	21,929	24,167	39,176
Electric lamps	22,467	25,209	29,594

This progress is reflected in the returns of exports, the bulk of which, it will be noticed (so far), are shipped to Eastern Asiatic destinations, notably Kwantung. It is significant, however, that this trade is becoming very widespread; for instance, the export returns relating to insulated wire include no fewer than fifty-three different destinations.

The Lamp Trade

Fresh headings were raised in 1934 with respect to exports of electric lamps, and therefore comparison with 1933 is not possible. No fewer than sixty-nine destinations are indicated in the export returns.

In contrast to the tendency in many lines of Japanese export the lamp trade is not preponderatingly with Asiatic countries but extends to Western markets, notably the United Kingdom and the United States. For example, out of the total value of approximately 1,560,000 yen worth of miniature incandescent electric lamps for decoration, 523,000 yen worth went to Great Britain, and 691,000 yen worth to the United States. The next largest customer, but with a much smaller total, was France, with 99,000 yen. In the trade in other miniature incandescent electric lamps (totalling 1,874,000) yen), Great Britain and the United States again preponderated with 436,000 and 480,000 yen respectively, while over 100,000 yen worth were taken each by France and Belgium and over 50,000 yen worth by India, Italy and Argentina.

Under the heading of "other incandescent electric lamps (not exceeding 32 c.p.)," totalling 3,127,000 yen, the United States is represented by no less than 825,700 yen, Great Britain by 341,000 yen, Kwantung, India, Netherlands, East Indies, Straits Settlements, Argentina, Brazil and Australia all by over 100,000 yen, while out of a total of 2,380,000 yen worth of unclassified electric lamps the United States took as much as 967,000 yen worth.

IMPORTS.	1934. Yen(000)	Inc. or dec. Yen(000)
Insulated wire—		
Total	100	+ 25
From United Kingdom	—	— 2
„ Germany	58	+ 18
„ United States	41	+ 9
Ammeters and voltmeters—		
Total	64	— 15
From United Kingdom	2	+ 1
„ Germany	9	— 10
„ United States	53	— 5
Wattmeters—		
Total	63	— 36
From Germany	20	— 40
„ Switzerland	15	+ 4
„ United States	29	+ 1
Batteries and parts—		
Total	134	+ 28
From United Kingdom	5	+ 3
„ Germany	74	+ 51
„ Sweden	10	— 13
„ United States	44	— 15
Telegraph instruments—		
Total	111	— 273
From United Kingdom	58	— 41
„ Germany	7	— 242
„ Denmark	11	+ 10
„ United States	22	+ 3
Radio receiving sets—		
Total	355	+ 17
From United Kingdom	6	+ 2
„ Holland	11	— 24
„ United States	337	+ 41
Other telephone instruments and parts—		
Total	1,002	— 1,268
From United Kingdom	71	— 288
„ Germany	479	— 1,011
„ France	273	+ 273
„ United States	175	— 201
Dynamos and motors, not over 100 kg.—		
Total	830	— 540
From Germany	398	— 416
„ United Kingdom	88	—
„ France	5	— 78
„ Switzerland	27	— 135
„ United States	310	+ 89
Dynamos and motors, not over 5,000 kg.—		
Total	146	— 46
From United Kingdom	12	— 25
„ Sweden	43	+ 32
„ Germany	31	+ 9
„ United States	46	— 73
Dynamos and motors, other—		
Total	248	+ 78
From Germany	100	— 25
„ Switzerland	41	+ 41
„ Sweden	108	+ 63
Dynamo sets—		
Total	2	— 111
Transformers—		
Total	85	+ 20
From United Kingdom	8	+ 3
„ Germany	10	— 13
„ Switzerland	22	+ 22
„ United States	42	+ 6
Carbon for electrical use—		
Total	1,498	— 66
From United Kingdom	49	—
„ France	89	+ 20
„ Germany	157	— 5
„ United States	1,202	— 84

EXPORTS.	1934. Yen(000)	Inc. or dec. Yen(000)
Insulated wire—		
Total	7,360	+ 2,760
To Manchukuo	426	+ 85
„ Kwantung	4,144	+ 1,820
„ China	1,710	+ 555
„ India	213	+ 64
„ Netherlands E. Indies	184	— 9
„ Siam	134	+ 84
Batteries—		
Total	1,444*	
To Manchukuo	78	—
„ Kwantung	713	—
„ China	66	—
„ India	93	—
„ Netherlands E. Indies	330	—
Telephone instruments—		
Total	5,240	+ 2,405
To South Africa	46	+ 39
„ Manchukuo	106	+ 9
„ Kwantung	4,078	+ 1,778
„ China	505	+ 448
„ India	60	+ 4
„ Netherlands E. Indies	61	+ 24
„ Siam	74	+ 1
„ Peru	172	+ 69
Electrical machinery—		
Total	10,055	+ 7,331
To Manchukuo	416	+ 259
„ Kwantung	8,506	+ 6,626
„ China	760	+ 413
„ Soviet Russia	58	— 67

* Not separately distinguished before 1934.

The Electrical Situation in Spain

IN his report to the Department of Overseas Trade on the economic conditions in Spain (Stationery Office, 1s. 6d. net), Mr. A. Adams, formerly Commercial Counsellor, H.M. Embassy, Madrid, states that the balance of trade for 1934 showed an adverse position, the discrepancy being larger than for the same period of 1933, and slightly above the figure for 1932. Spain's trade balance has, however, always been adverse, and the figures are not high enough to cause undue concern.

The growth of confidence in the inherent stability of the country is reflected in the prices of Government and other securities on the Madrid Stock Exchange, and it appears likely that the general economic situation of the country as a whole will steadily improve during the current year. Dealing with the imports of electrical goods into Spain, Mr. Adams states that the United Kingdom held a fair share of the market for dynamos and electric motors from one to ten tons and over in 1934. Germany, Sweden and Switzerland are our principal competitors. Of the imports of accumulators weighing less than 25 kg. per unit, the United Kingdom now supplies 50 per cent., while the United States has fallen to second place. The total imports increased from 29,210 kg. in 1933 to 42,078 kg. in 1934, of which increase the United Kingdom was responsible for by far the larger part. By contrast, although imports of dry batteries have fallen a little, the United Kingdom share, after a sudden rise in 1933, has fallen again to 2 tons out of a total of 197 tons.

Signs of quickened activity are evidenced by the purchases of raw materials and other products used in industry. Importation of machinery in general during 1934 as compared with the preceding two years showed that the cloud of depression in 1933 had lifted somewhat. These figures regarding machinery are accompanied by similar import figures for electrical machinery, scientific and other instruments.

For some years past a fairly steady increase, round about 4 per cent. each year, had been visible in electrical consumption in Spain, but the quasi-stagnation in the industrial situation of the country in 1934 prevented this increase being shown during that year. According to technical reports on the industry, there is excess production capacity of electrical energy of about one thousand million kWh over consumption. In face of this situation no new hydro-electric works were started, and

the developments carried out during 1934 have been a continuation of the construction work on existing proposals. Of the principal supply companies, the Saltos del Anero S.A. has completed the installation of the first of the three groups of 60,000-h.p. generators at the Esla Dam and laid down a carrier line to Bilbao, capable of taking 130,000 kW. The company was expected to begin distributing electricity to the amount of 80,000,000 kWh during the first quarter of 1935. The Cinquetta dam of the Hydroelectric Ibérica was opened in 1932, and the company has commenced working those at Millar Alto (4,300,000 cu. metres) and Sen (3,400,000 cu. metres), which make use of natural lakes. Developments in the electrical field have been the normal and necessary increases in the distributing systems of the large concerns, and an extension of the Madrid Metropolitan Railway from the Puerta del Sol to the Plaza de las Embajadores, a distance of 1½ km. The electrification of the Madrid-Villalba-Avila and Segovia section of the North Railway has not yet been carried through.

New Books

Short Wave Therapy. By D. ERWIN SCHLJEPHAKE. Pp. 238; figs. 94. London: The Actinic Press, Ltd. Price 21s.

This book is a valuable addition to the small amount of literature available in English upon a comparatively new and important subject. It refers to the medical applications of radiations having wavelengths between 3 and 20 metres; these, up to the present, having been found most effective for heating the tissues of the body by the method under discussion. Arrangements whereby the body may be caused to act as the dielectric in a h.f. field, and the manner in which the resultant heating consequent upon the dielectric losses may be utilised for curative purposes, are dealt with in a clear and concise manner.

Losses in the organic dielectric and the heating effect upon electrolytes are discussed, stress being laid upon the fundamental difference between the short-wave method of heat generation and the older, well-established method known as diathermy. In the latter case longer wave lengths are employed, the energy usually being applied by means of electrodes in direct contact with the skin, but the current flows through tissues having the least ohmic resistance and neglects others from the practical viewpoint.

Short-wave therapy involves the placing of the subject in the h.f. condenser field, the resultant heating of the tissues being governed by their respective specific inductive capacities. The author also lays stress upon the characteristic distinguishing the method from the older ones, namely, the strong heating effects produced in the deep-seated parts of subjects treated. The selective action of certain wavelengths upon different tissues is investigated, also the influence of the short-wave field upon bacteria. The opening chapters are devoted to a non-mathematical treatment of the principles underlying the production of h.f. oscillations by means of spark gap and valve circuits. Space is also devoted to an account of the author's experimental work, the remainder of the book being mainly of medical interest.

Everyman's Wireless Book. By F. J. CAMM. Pp. 288; figs. 243. London: George Newnes, Ltd. Price 3s. 6d.

This is a non-technical book devoted to an explanation of the functions of the various components of a broadcast receiver. No technical knowledge whatever has been assumed and the author (the editor of *Practical Wireless*) has gone to some length to select and simplify his explanations. An exceptional number of excellent illustrations aid these definitions. The book is divided into twenty-five chapters of elementary instruction in every phase of reception. It carries a useful fault-finding chart and describes a large number of simple —but often necessary—tests.

The technician may criticise some of the devices suggested to overcome specific troubles. Some of the methods of testing and measuring electrical quantities are also unnecessarily elaborate, or likely to give misleading results, having regard to the quality of apparatus likely to be available. Nevertheless, the book will certainly give the non-technical listener, or constructor, a full explanation of what he is about.

Electric Elevators. By F. A. ANNEIT. (Second edition.) Pp. 495; figs. 346. London: McGraw-Hill Publishing Co., Ltd. Price 30s.

Since the publication of the first edition of this volume in 1927 important advances have been made in the design and construction of electric elevators, particularly of the passenger type. Special studies have been made of signal systems, and a great variety of drops have been developed for use in annunciators.

Electric elevators may be classified into two main groups, *viz.*, the traction type and the drum type. A method for the automatic levelling of an elevator at the landing position has been developed, in which pliotrons are applied with variable voltage control, the levelling being done by means of the main machine. In considering the power consumption of an elevator motor the principal factors are the type of machine, type of control and the number of stops per car-mile. Practical tests have shown that in an elevator averaging 180 stops per car-mile and applying rheostatic control the average power consumption amounted to 8.1 kWh per car-mile. With variable control, and making about 100 stops per car-mile, the power consumption was 4.5 kWh per car-mile.

In this edition several of the sections of the volume have been revised in order to bring the text into conformity with recent developments. A number of new sections have been introduced; these include a general description of hoist-way door operations and a survey of signal systems. In a new section devoted to the construction and inspection of ropes the author gives an illustrated description of the various systems now in use, together with methods of socketing cables ordinarily employed.

A valuable contribution to the subject has been made in a new chapter dealing with double-deck cars and two cars in one hoist-way. The safety devices are detailed and the method applied in which the approaching car is stopped in three stages by the differential gearing is described. In a number of cases aluminium is used in the construction of car slings and platform framings, with a consequent economy in the power required, and also decrease of stresses in the supporting structure.

The subject is dealt with in a highly practical manner and a wide field is surveyed, due regard being paid to the relative importance of recently developed technique. This second edition has been well prepared and is an important contribution to electrical literature.

Noise—A Comprehensive Survey from Every Point of View. By N. W. MCLACHLAN. Pp. 148; figs. 62. London: Oxford University Press. Price 6s.

It is welcome to have such a book as Dr. McLachlan has written on this subject, for many branches of science and industry are beginning to realise its importance in relation to human life.

If one recalls the attitude of the Victorian mind to smoke abatement it will be realised that there is yet a tremendous amount of prejudice to be broken down before noise abatement is accepted as a public essential, for just as the Victorian regarded black smoke pouring out of a tall stack as his emblem of prosperity so does our present-day industrialist regard the whirr of machinery and the clatter of typewriters as an indication that business is thriving. However, what may be "music" to one may be a nuisance to a hundred others, and Dr. McLachlan gets to the root of the matter by defining noise as "any unwanted sound."

This brilliant and original definition sums up the physiology of the situation, for noise is no regarder of quality. An exquisitely beautiful song can be a nuisance if a person wishes to concentrate on some other matter. For reasons such as this Dr. McLachlan has had to steer his way very cautiously among the pitfalls which render this subject a difficult one, and he has been very successful.

Introduction to the Study of Physical Metallurgy. By W. ROSENHAIN. (Third edition. Revised and partly rewritten by J. L. Haughton.) Pp. 368; figs. 159. London: Constable & Co., Ltd. Price 20s. net.

The early editions of this publication comprise one of the most notable contributions that Dr. Rosenhain made to the literature of physical metallurgy, and is a fitting memorial to one who made a lifelong study of metallurgical problems. The present edition is a revision by Dr. Haughton, who, as principal scientific officer at the National Physical Laboratory, worked in close association with Dr. Rosenhain for a number of years. The subject-matter has been brought into line with modern developments, necessitating the rewriting of Chapters V to VIII in order to incorporate much of Dr. Rosenhain's later investigational work.

In the revised chapters dealing with the thermal study of metals and alloys the older methods of heating and cooling specimens of metals for thermal study are discussed, and there is an illustrated description of a recently designed furnace in which, instead of the specimen moving, it is the furnace which moves. While this requires a slightly more complicated mechanism than the earlier form, it has several marked advantages. An excellent résumé is given of the ideal equilibrium diagram of a simple binary eutectiferrous system, together with a consideration of some of the complications which are introduced into the diagram when the simple ideal condition is departed from in varying degrees. The conclusion drawn by the author is that the complete detailed study of ternary-alloy systems from the equilibrium point of view is not as yet of vital practical importance, although it is too early to suggest that the fuller study of the more complex systems may not reveal the existence of materials of unexpected interest. The revised Chapters VII and VIII treat the constitution and structure of alloys in a very general way with a detailed study of a few selected systems.

Dr. Haughton has not only well maintained the high standard of this publication, but has also been able to carry out the revision in the style that was so characteristic of Dr. Rosenhain's writings.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Municipal Trading at Liverpool

The Liverpool Corporation Electric Power and Lighting Committee has reported on a notice of motion submitted to the May meeting of the City Council suggesting that, with the object of relieving heavily rated shopkeepers who are engaged in the sale and distribution of electrical goods and equipment, the Corporation should desist from competition with them. The Committee states that if all its selling activities were to cease, the Corporation could not carry out any further assisted wiring installations, 20,000 of which have been put in hand in the last few years. This work had given employment to a large number of electricians, in addition to some 300 or 400 men in the mains department. The full recognised discount was given to the electrical trade in respect of any business transacted at the showrooms and many contractors took advantage of this. The committee has urged the Council to continue to operate its selling powers under the Electricity (Supply) Acts and the local Acts as at present.

Australian Regulations for Electrical Equipment

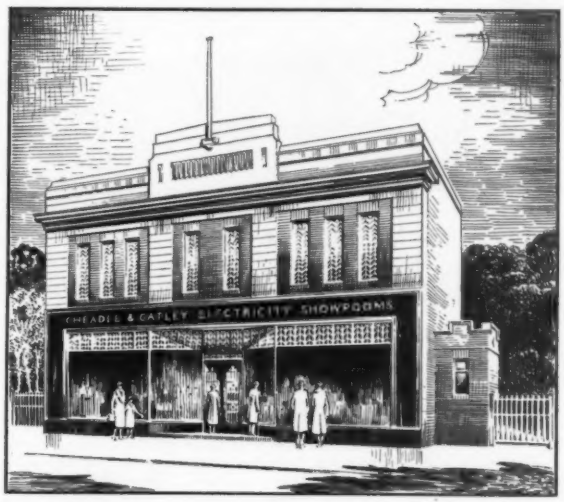
H.M. Trade Commissioner in Victoria and South Australia reports that regulations have been issued by the State Electricity Commission of Victoria under the State Electricity Commission Act, 1934, and the Public Authorities Marks Act, 1930, relative to the approval of electrical equipment. The regulations are styled Electrical Approvals Regulations—Approval of Equipment, 1935, and came into operation on June 16th. The regulations provide for the examination, testing and approval, and the withholding and withdrawal of approval of appliances, fittings, wires, apparatus and materials intended for use in any electrical installation. Provisions are also made for reasonable fees to be charged for such an examination and testing and for reports in respect of such appliances and materials, also for the testing, stamping, or marking of articles to which the Public Authorities Marks Act, 1930, applies. An Order in Council published in the Victoria Government Gazette, dated June 19th, gives the first list of the classes and types of electrical appliances which are not to be exposed for sale or advertised for sale after October 1st next unless such apparatus or material has been approved by the State Electricity Commission of Victoria. The first list includes the following: Lampholder adaptors (single or multiple); plug sockets and plugs; plug socket adaptors; apparatus connectors; cord connectors; flexible cords in which no conductor exceeds 0.007 sq. in. in cross section; bread toasters and grillers with open or only partially enclosed elements; and handlamps. The Commission points out to intending applicants for approval of electrical equipment that applications, together with all necessary samples, are to be in the Commission's hands at least two months before approval is desired. Copies of these documents are available on loan from the Department of Overseas Trade, 35, Old Queen Street, S.W.1.

New G.E.C. Showrooms at Nottingham

The General Electric Co., Ltd., has recently transferred its Nottingham branch to more spacious premises at 25, Storey Street, which is situated in the old lace market of Nottingham. The new showrooms, stores and offices are a great improvement on the restricted accommodation at 4, Chapel Bar, where the branch was first opened in October, 1912. The exterior of the new offices attracts attention by the name sign which surmounts the ground floor windows and main entrance. Immediately within the swing doors and running at right angles is a wide and well lighted hall, the left half of which is very attractively arranged for the demonstration of "Magnet" cookers, water heaters and fires, and the display of the smaller electrical appliances for the home. In the other section of the hall, to the right, is the wireless department. The largest of the ground floor departments which is approached directly from the main entrance, is entirely devoted to a very extensive range of electric lighting fittings. These showrooms are artistically decorated in cream and silver and in all of them the exhibits are set out without congestion. The trade counter is immediately adjacent to the stores.

New Cheadle Hulme Showrooms

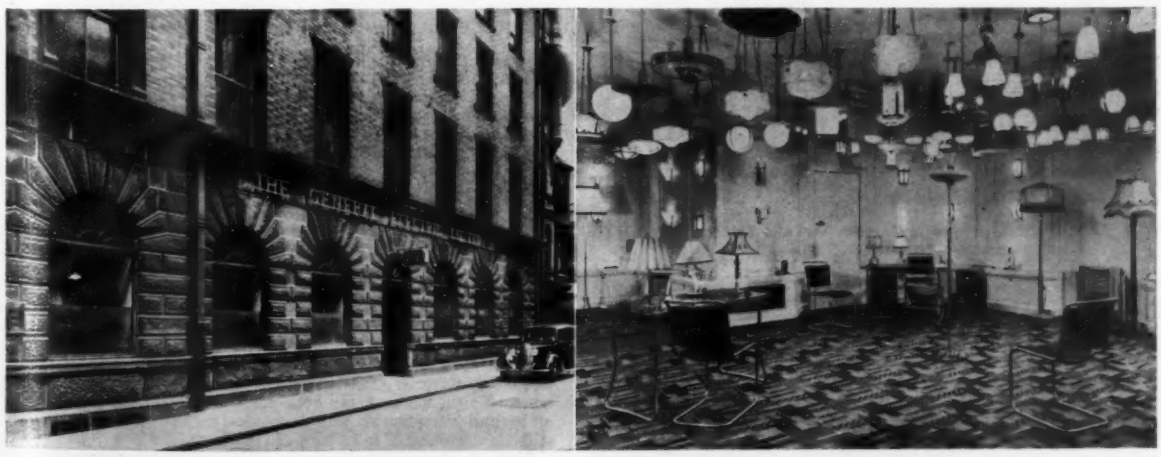
Mr. R. W. Willis, engineer and manager of the Cheadle and Gatley Urban District Council Electricity Department, has sent us the accompanying drawing of the new showrooms which are now in course of erection in the Cheadle Hulme district. The lower part of the ground floor will have extensive window space for display purposes, and it is intended to arrange matters so that people looking in the window can see directly into the showroom. The first floor will be retained for demonstration and lecture purposes, and arrangements have been made at the back of the premises for an office for the payment of accounts.



A front elevation drawing of the new Cheadle Hulme showrooms

Orders Recently Booked

The London Passenger Transport Board has placed orders for 300 trolley-buses and states that it is possible that more will be ordered later. A total of 120 new buses now being built will be running towards the end of the year, and the additional 300 early next year. Orders for the latest 300 buses have been placed as follows:—Associated Equipment Co., Ltd., 200 chassis; Leyland Motors, 100 chassis and 100 bodies; Birmingham Railway Carriage & Wagon Co., Ltd., 100 bodies; Metropolitan Cammell Weymann Motor Bodies, Ltd., 100 bodies; Associated Electrical Traction Equipment, Ltd., 300 sets of electrical equipment.



The new premises of the G.E.C. Nottingham branch showing the exterior and the lighting fittings showroom

Among the orders recently received by International Combustion, Ltd., are coal and ash handling plant for Carlisle electricity works, coal handling plant for Norwich Electricity Department and steelwork and two special trippers for Stourport (per Edmundson's Electricity Corporation, Ltd.).

The London and North-Eastern Railway Co. has placed an order with the Metropolitan-Cammell Carriage & Wagon Co., Ltd., for 131 steel coaches, comprising sixty-four motor coach units, two double-bogie motor coaches, and one double-bogie motor van in connection with the electrification of the line between Newcastle-on-Tyne and South Shields.

The Great Yorkshire Show

At the recent Great Yorkshire Show, the Sheffield Corporation had a large stand on which there was a comprehensive display of electric apparatus for the farm and for domestic purposes. Our illustrations show the electric kitchen in which frequent working demonstrations were given, and some of the electrically driven farm apparatus.

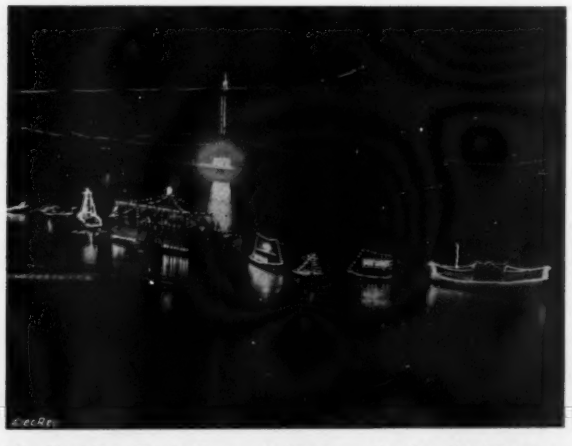
A display of electric farm and domestic apparatus by the Sheffield Electricity Department at the Great Yorkshire Show

A Paris Fair Catalogue Library

We are asked to draw our readers' attention to the facilities offered by the catalogue library of the Paris International Trade Fair at 17, Tothill Street, S.W.1. This library has been established to promote a closer co-operation between France and Great Britain, and exhibitors are invited to send copies of their catalogues or other publications giving an indication or classification of their products for reference purposes for those who care to avail themselves of this facility.

The Ramsgate Venetian Fête

The Ramsgate Borough Council recently bought the Ramsgate Harbour from the Ministry of Transport, and one of the chief attractions of the holiday season was a Venetian fête with illuminated boats and fountains. For these illuminations "Beeantee" material was used.



The Venetian fête in Ramsgate Harbour showing the illumination of the boats by means of "Beeantee" material

Big Contract for Aviation Lighting

The General Electric Co., Ltd., has received from the Indian Stores Department the largest contract for aviation lighting equipment ever placed in the British Empire. This is to be used on the Karachi-Rangoon route, which extends over 2,708 miles, and includes the following aerodromes:—Bombay, Karachi, Hyderabad, Uterlai, Badhal, Delhi, Cawnpore, Allahabad, Dobhi, Calcutta, Akyab, and Rangoon. The distances between these, according to information furnished by Imperial Airways, varies from 84 to 553 miles. The lighting material employed in the "Across India" scheme, is somewhat similar to that at Croydon Aerodrome. It consists of 9-kW G.E.C. landing floodlights, combined floodlight beacons, rotating 1½-kW route beacons, boundary lights illuminated wind direction and velocity indicators, obstruction lights, in all of which "Osram" lamps are used, cables for wiring, switchgear and other controlling apparatus, as well as generating plant for those aerodromes which owing to lack of available supply have to generate their own electricity. This contract forms part of the Indian air development programme for which nearly £700,000 was voted in the last Indian Budget.

Czechoslovakian Radio Import Duty

It is reported from Prague that the Czechoslovakian Government intends to impose an import duty on radio apparatus in order to assist home industry. It is considered probable that only imports of apparatus not made in the country will be permitted, and the import duty on these will be fixed at 5 per cent. of the invoice value.

A Steel Company's Diamond Jubilee

Messrs. Fredk. Braby & Co., Ltd., of Glasgow, are celebrating their diamond jubilee this year. After the late Mr. Fredk. Braby established works in London, Deptford and Liverpool, he went to Glasgow sixty years ago and founded the Eclipse Works which to-day give employment to 1,400 workers in ten separate departments each producing different classes of steel products. During these years the company has regularly paid dividends, and this month it is paying a dividend to both ordinary and preference shareholders of 7 per cent., as compared with 2½ per cent. on the ordinary last year. The company has reissued a trade chart (the first of which appeared in 1872) as a diamond jubilee souvenir, showing the cyclical nature of trade.

The Prague International Fair

Owing to the continually increasing importance of the Prague Fair to Czechoslovakia's export trade, the fair management has resolved to open the next autumn session two days earlier, viz., on August 30th. The Fair will end, as usual, on September 8th. This arrangement will enable visitors to the Leipzig Fair to attend without any loss of time.

A Safety First Booklet

The National "Safety First" Association (Inc.), has published a booklet entitled "Beware" which contains hints for the prevention of accidents in the home, and out of doors (holiday hints). A useful chapter on electrical safety precautions in the home is contributed by Miss C. Haslett.

Lamp Manufacture in Rumania

It is announced from Bucharest that the Transylvania Mining Co. ("Petrosani") has received permission to establish an electric lamp works. The bulbs will be supplied by the glass works at Diciosanmartin. The company will joint the Continental Lamp Syndicate and also produce radio valves.

Illumination of the "Queen Mary"

The General Electric Co., Ltd., the British Thomson-Houston Co., Ltd., and G.V.D. Illuminators, Ltd., have received orders for lighting fittings for the new Cunarder *Queen Mary*.

Trade Announcements

The London Electric Wire Co. & Smiths, Ltd., announces that its head office has been transferred to 24, Queen Anne's Gate, Westminster, London, S.W.1. The telegraphic address, "Electric, London," will remain unchanged and the new telephone number is Whitehall 8671. The address at 7, Playhouse Yard, E.C.1, will be retained for the London branch office and warehouse, and the sales in the London area will still be conducted from the old address.

Astralite Electrical Products is removing to-morrow (Saturday) to 48, Church Street, N.16, which is also the address of the Astralite Installation & Maintenance Co. The telephone number remains unchanged.

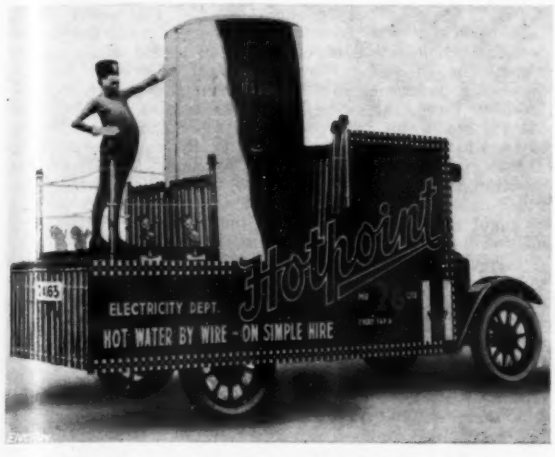
Ensign Lamps, Ltd., has now completed arrangements for the opening of its Midland depôt at 17, Parade, Birming-

ham, 1 (telephone: Central 2997). Mr. W. G. Lund has been appointed manager.

The Patent Gear and Metal Hardening Co., Ltd., has changed its name to Shorter Process Co., Ltd., and is moving its head office and main works to Celtic Works, Savile Street East, Sheffield, 4.

The Hotpoint "Redman"

The accompanying illustration shows a decorated lorry which recently appeared in a carnival connected with a historical pageant. The lorry was fitted with Hotpoint circulators and



The Hotpoint "Redman" in a historical pageant

surmounted with a large cut-away cylinder. An additional attraction of the display was a man representing the Hotpoint "Redman."

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances.

CHEMICALS, ETC.	Price, August 14th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4¼d.	—
a ,, Perchlorate... ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ,,	1/2 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£209	£4 dec.
Grade II ... ... ,,	£144	£3 dec.
Grade III... ... ... ,,	£75	—
c Brass (rolled metal 2" to 12" basis) per lb.	7d.	—
c ,, Tubes (solid drawn) ... ... ,,	9½d. to 9¾d.	—
c ,, Wire, basis ... ... ,,	7¾d.	—
c Copper Tubes (solid drawn) ... ,,	10d.	—
g ,, Bars (best selected)... ... per ton	£62	—
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£35 15s.	15s. inc.
d ,, Wire Rods ... ,,	£41 5s.	5s. inc.
d ,, ,, H.C. Wire ... per lb.	6 7/8d.	1/8d. inc.
f Ebonite Rod ... ... ,,	1/6 to 2/- plus	—
f ,, Sheet ... ... ,,	1/2 to 1/6 10%	—
n German Silver Wire ... ... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	4¼d.	—
i Iron, Pig, (Cleveland No. 3) ... per ton	62/6	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	—
g Lead, English Pig ... ... ,,	£17 10s.	5s. inc.
g Mercury ... ... per bot.	£11/7/6 to £11/17/6	—
e Mica (in original cases) small ... per lb.	6d. to 1/-	—
e ,, ,, medium ... ,,	5/- to 10/-	—
e ,, ,, large ... ,,	10/6 to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11¼d.	—
p ,, ,, rolled strip & sheet ,,	10¾d.	—
p ,, ,, wire ... ... ,,	11¼d.	—
o Platinum ... ... per oz.	£7	—
d Silicium Bronze Wire ... ... per lb.	7¼d.	¼d. inc.
r Steel, Magnet, in bars ... ... ,,	7½d.	—
g Tin, Block (English)... ... ... per ton	£223 10s.	£9 10s. dec.
s ,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
India Rubber, Gutta Percha, and Telegraph Works Co., Ltd.
f Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead and rubber, up to the time of going to press, are given in our "Business Notes" under the same heading.

French Domestic Electrical Appliance Trade

The appended table shows the French imports of domestic electrical appliances during the three months ended with March last as compared with the corresponding quarter of 1934.

	Imports. Jan.-March, 1934. Fr.	1935. Fr.
Electric fires and stoves ...	1,204,000	862,000
Electric irons...	49,000	16,000
Electric vacuum cleaners, boot cleaners, etc.... ...	751,000	519,000
Electric refrigerating machines, etc.	3,296,000	1,207,000
Electric fans	105,000	109,000
Total	5,405,000	1,713,000
Total at 74½ fr. to £...	£72,310	£22,915

The chief feature of the imports is the marked decrease which has taken place so far this year in the purchase of imported appliances, and particularly household refrigerators. As a result of Government economy measures the French Customs authorities are condensing the information given on the export side, only the one total for the various items being now given. In this case, too, a decline is indicated for 1935, the total being 2,433,000 fr. (£32,550) against 2,941,000 fr. (£39,345).

N.Z. Orders for British Goods

The *Board of Trade Journal* reports that orders for the following material are to be placed with British firms by the new Zealand Government:—Three 1,667-kVA transformers, three 50-kV potential transformers, 2,000 wall telephones, and a large quantity of telephone cables.

Transformer Oil

We are informed that a plant for treating solar oils has been put down in Batoum, and that the first cargo of Russian transformer oil has arrived in England to the order of Russian Oil Products, Ltd., who, we understand, hold the sole agency for Great Britain and the British Empire. We are informed by the company that deliveries of the transformer oil will be centrifuged and tested for di-electric strength before dispatching from their plant at Barking.

The B.E.A.M.A. Dinner

The annual dinner of the British Electrical and Allied Manufacturers' Association will be held at the Connaught Rooms, W.C., on November 21st, when the president, Lord Derby, will be in the chair.

For Sale

Birmingham Electric Supply Department has for sale a 5,000-V synchronous motor with exciter, and other equipment. (See our classified advertisements.)

New Catalogues and Lists

Igranic Electric Co., Ltd., Bedford.—A booklet on the "Turica" press for packing and wrapping standard newspaper bundles.

British Aluminium Co., Ltd., Adelaide House, King William Street, E.C.4, has issued a booklet on structures in aluminium.

Silvertown Lubricants, Ltd., Minoco Wharf, West Silvertown, E.16.—A new edition of the company's electrical oils booklet is available. Methods of sampling, testing and handling transformer oils, &c., are described.

M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.—Pamphlet K112/13 on type A190 flameproof oil-immersed automatic gate-end boxes.

Rhodes, Brydon & Youatt, Ltd., Gorsey Mount Street, Stockport, have published a brochure on self-priming pumps.

Members of the Wallasey and Birkenhead Electrical Trades Golfing Society at the July meeting at which the Drury Challenge Cup and replica were competed for

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—An illustrated description of Fraser & Chalmers-Marshall wagon tippers of the side discharge type.

Hackbridge Electric Construction Co., Ltd., Walton-on-Thames, has issued a descriptive and illustrated publication dealing with large naturally cooled transformers.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne, have issued a number of new pamphlets dealing with protective gear, air-break switches, and plugs. There is also a booklet on modern

farming and pamphlets on Holmes motors and arc-welding equipment. An index to the data files and pamphlets showing the position of each pamphlet in the files and complete catalogue has also been issued.

Bankruptcy Proceedings

F. V. Lambert (trading as Lamberts), electrical contractor, 31, Harmer Street, Gravesend.—The statutory first meeting of creditors was held on August 7th at London Bankruptcy Buildings before Mr. F. C. Wells, District Official Receiver. A statement of affairs was submitted showing total liabilities £2,506 (ranking £970) and net assets of £575. According to the debtor's statement he began business in 1922 as a contractor for electric lighting. But the trading was unsuccessful mainly through lack of capital and the purchase of unnecessary stock, and in April, 1926, he was made bankrupt, from which proceedings he has been discharged. During the next four years he managed a business for his wife at 7, Old Road West, Gravesend, and in August, 1930, he took it over, closed it down, and transferred the stock to Harmer Street, where he has since continued. The business consisted chiefly of the installation of electric lighting apparatus in houses in the Gravesend district. The debtor adds that he fell ill in November, 1933, and that caused his present failure. A resolution was passed for Mr. W. A. J. Osborne, Accountant, Finsbury Pavement, E.C., to act as trustee with a committee of inspection.

H. T. Ballantyne, 14, Waterloo Crescent, late 8, Waterloo Mount, later 75, Westover Road, all Bramley, Leeds, electrical engineer.—This debtor filed his own petition, and his statement of affairs showed gross liabilities of £202, of which £175 was expected to rank for dividend, with a deficiency of the same amount. Debtor commenced business on his own account about six years ago with a capital of £10. He attributed his failure to illness of his wife and lack of capital.

J. Cameron, 43, Camp Road, Leeds, electrical engineer, trading as J. Cameron.—This debtor filed his own petition, and his statement of affairs showed gross liabilities of £1,507, of which £1,347 was expected to rank for dividend, and there were net assets of £89, or a deficiency of £1,257. The debtor commenced trading at the above address in October, 1933, without capital. He did general repair work and undertook contracts for wiring work in connection with cinemas in Leeds, but lost about £170. Since November, 1934, the trade had fallen away and debtor had been unable to meet his overhead expenses and liabilities for goods supplied. He attributed his failure to lack of capital and bad trade.

A. Harrison, 110, Town Street, Horsforth, Leeds, lately 9, Stanmore Crescent, Burley, Leeds, electrical engineer and contractor.—This receiving order was made on the debtor's own petition, and his statement of affairs showed gross liabilities of £189, of which £169 was expected to rank for dividend, with net assets of £55 and a deficiency of £113. Debtor attributed his failure to lack of capital, keen competition and bad debts.

G. Harding, The Grange, Barcombe, Sussex, formerly a partner in the firm of Harding & Botten, lately 12, Emerald Street, London, electrical engineer.—The application for discharge herein was heard at the Court House, Church Street, Brighton, on August 8th. It was stated that applicant had been adjudged bankrupt before, and had paid no dividend to his creditors. Subsequently he had paid a composition of 3s. 3d. in the £ to another set of creditors. No dividend had been paid and the assets were insufficient to the extent of £25 for payment in full of the law costs. The discharge was granted subject to a suspension of three years.

A. P. W. Hadley, electrical engineer, trading as Express Electrical Supplies Co., 12, Percy Street, W., and New Broadway, Hampton Hill.—The receiving order in this case was made at the London Bankruptcy Court on the petition of Pope's Electrical Lamp Co., Ltd., and the first meeting of creditors was held on August 9th, when the liabilities were estimated at £500 and the assets were stated to include book debts, £300; an equity of redemption in a dwelling house, £225; and other items, £90. Debtor stated that in July, 1933, he started on his own account at Berners Street, W., as a manufacturers' agent and in October, 1934, began to trade at Percy Street as the Express Electrical Supplies Co. He obtained an agreement with the Electric Lamp Manufacturers' Association but it was subsequently cancelled at the instance of a creditor. He sold the business in March last to Express Electrical (Hampton), Ltd., for £300 (not yet received), and acted as managing director of the company until he resigned office on June 21st, 1935. The debtor attributes his failure to loss of a valuable agency, bad debts and heavy overhead charges. The case was left in the hands of the Official Receiver.

G. F. Kennedy (Kennedy & Co.), electrical engineer, Market Square, Shepton Mallet.—Receiving order made August 10th on debtor's own petition.

J. Cooper (J. Cooper & Son), electrical engineer, 30, Warner Street, Haslingden.—Receiving order made August 2nd on debtor's own petition. Public examination September 13th at the County Court Buildings, Rochdale.

N. H. Wood, electrical engineer, 32, Highbury Avenue, Thornton Heath.—Discharge suspended for two months until September 3rd.

J. D. Dickinson, wireless and electrical dealer, 671, Chesterfield Road, Sheffield.—Trustee, Mr. L. J. Clegg, 14, Figtree Lane, Sheffield, Official Receiver, released July 23rd.

H. C. Bridgman, electrical engineer, 37, Canynge Road, Clifton, Bristol.—Public examination September 27th at the Guildhall, Bristol. (Amended notice.)

S. Hancock (S. Hancock & Co.), electrical engineer, Clyde Street, Holt Town, Manchester.—Receiving order made August 1st on debtor's own petition. Public examination September 13th at the Court House, Quay Street, Manchester.

E. Leighton, wireless dealer, 497, Hessle Road, Hull.—Public examination August 20th at the Guildhall, Hull.

G. Batty (Combine Radio Co.), 3, Briggate, Leeds.—Public examination September 17th at the County Court House, Leeds.

W. J. Davies, radio and electrical engineer, 230, Great North Road, Woodlands, near Doncaster.—Last day for receiving proofs for dividend August 23rd. Trustee, Mr. F. E. Bendall, 27, York Street, Sheffield.

Electricity Supply

Lighting, Domestic, Power

Australia.—SUPPLY SCHEME INAUGURATED.—The Lieut.-Governor of Western Australia (Sir James Mitchell) has inaugurated an electricity supply scheme established by the Pemberton Power & Lighting Co., the company being the first to install a hydro-electric plant in the State. Sir James Mitchell prophesied the extensive use of hydro-electric power in the near future in other parts of Western Australia.

THE N.S.W. ADVISORY COMMITTEE.—The appointment of the Electricity Advisory Committee under the recent Act has been gazetted. The committee is charged with the duty of devising schemes for the co-ordination of electricity supplies throughout the State, without interfering with the self-governing powers of the supply authorities. Mr. Spooner, Minister for Local Government, states that he proposes to ask the committee to investigate a scheme for the formation of an Electricity County Council for the upper south coast. The committee will also be asked to suggest a scheme for the distribution of electricity in the south coast rural areas. Furthermore, it will deliberate at an early date on problems of major development, including the extension of main transmission lines.

Bexley.—ANNUAL REPORT.—An increase of 24.3 per cent. in the electricity purchased by the Department is shown in the report of the electrical engineer for the year ended March 31st, 1935, the amount being 13,269,347 kWh; but for the abnormally mild winter the increase would have been even greater. The maximum load rose by 29.1 per cent. to 5,504 kW, but as it was not sustained the load factor declined from 28.59 to 27.43 per cent. During the year 4,438 new consumers were connected, bringing the total to 20,680.

Blackpool.—LOANS.—The Electricity Committee has obtained sanction to borrow £115,000 for mains and £4,500 for plant.

Caernarvon.—FLOODLIGHTING THE CASTLE.—During the Welsh National Eisteddfod, Caernarvon Castle was illuminated each night by the means of "Mazda Mercra" lamps in "Mazdalux" floodlight projectors. The lighting scheme was planned by the B.T.H. Co., in collaboration with Mr. A. C. Pike, borough electrical engineer, and Mr. Price F. White, consulting engineer, and the installation work was carried out by the Electricity Department. All the units were concealed in the moat. The commanding situation of the castle makes it a perfect subject for floodlighting, although the irregular plan and many towers introduce certain difficulties. Light and

A view of the King's Gate and Well Tower, Caernarvon Castle, floodlighted with "Mazda Mercra" lamps in "Mazdalux" projectors for the Welsh National Eisteddfod

shade effects were produced by grading the illumination in order to accentuate the various architectural features of the building, and some idea of the result achieved may be gathered from the accompanying photograph. A total distance of 600 ft., with a wall area of 35,800 sq. ft., was covered by the floodlighting. Altogether, 63 400-W electric discharge lamps in 41 horizontal and 22 vertical projectors were employed. The treatment of the King's Gate to accentuate the architectural features and to give an appearance of solidity was particularly effective. Here, not only the statue of Edward II showed clearly in its niche, but even the sockets in which the original drawbridge used to operate could be distinctly seen. Ferns and lichens growing on the castle walls were also visible.

Cheadle and Gatley.—CORRECTION.—In our last issue a note appeared relating to the activities of the Electricity Department during 1934-35, and it was there stated that the amount of rates paid was £1,334, against £2,418 in the preceding year. These figures should, of course, have been in the reverse order; we suppose that for no undertaking has the burden of rates decreased during the last year or two.

Cumberland.—ELECTRICAL INSTALLATIONS.—The County Council is to spend £870 on installing electrical facilities in county properties, including police stations, schools and offices.

Dumfries.—RURAL ELECTRIFICATION.—The County Council, following its policy of developing rural areas, has agreed to an overhead line being erected from Langholm to Eskdalemuir at an estimated cost of £10,000. At first there will be only 41 consumers, 21 of whom are cottagers.

Epsom.—A PROGRESSIVE UNDERTAKING.—During July the output of electricity increased by 19.5 per cent. over that of July, 1934. On August 3rd the L.C.C. mental hospital in the area, which has had its own power station since 1902, commenced taking the whole of its supply (amounting to nearly 1,000,000 kWh per annum) from the Epsom Electricity Department. This was the only remaining private plant in the Epsom area. The Department has now 1,070 cookers connected among 4,500 consumers out of a possible number of 5,500. The Waterworks Department has been taking its energy from the Electricity Department for over twelve months, representing nearly 1,000,000 kWh per annum, purely a day load. The whole of the public street lighting is electric, and Col. H. W. Watts, the electrical engineer, informs us that this will shortly be improved and brought up to date. The amount of electricity sold for the year ended March 31st last was 6,281,125 kWh, as compared with 5,842,260 kWh in the year ended March, 1934.

Federated Malay States.—MORE ELECTRICITY USED.—Chiefly as a result of activity in the tin mining industry the amount of electricity generated during 1934 by plant of over 100 kW was 61 per cent. higher than in the preceding year (228,000,000 kWh, compared with 141,000,000 kWh). In his annual report Mr. W. J. Williams, Adviser on Electricity, Malay States, shows that of the total output 167,600,000 was generated by hydro-electric plant, mostly in Perak. The requirements of tin mines amounted to nearly 176,000,000 kWh, as compared with 54,500,000 kWh in 1933. The State Electrical Department made good progress, and at the end of last year the energy sold per month was more than in the whole of 1926, when the department was separated from the Public Works Department. From April until the end of the year the record of kWh sold per day was broken no fewer than twenty-five times in the Kuala Lumpur area. The total sales exceeded 31,000,000 kWh, the revenue amounting to $2,208,165 (against $1,810,426), an increase of 21 per cent. Expenditure rose from $1,047,197 to $1,106,914, an increase of 5.7 per cent., the gross surplus being $1,101,251, and net balance $206,370. This favourable position was contributed to by the low working cost of the Ulu Langat installation. The plant exceeded expectations, generating 16,300,000 kWh at a cost of 0.177 cent (0.049d.) per kWh, after allowing for 2,300,000 kWh supplied without charge to the Sungei Besi Mines. When provision is made for interest at 4½ per cent. on the capital cost of the installation and sinking fund charges, the cost per kWh does not exceed 0.95 cent. (0.26d.).

Gillingham (Kent).—DOMESTIC APPARATUS.—The borough electrical engineer is to prepare a scheme for the hire-purchase of electric cookers, water heaters, and wash-boilers.

FRINGE ORDER TERMINATED.—The Kent Electric Power Co. has given notice of its intention to supply, as from October 1st next, sixty consumers whom the Council has been supplying under a Fringe Order, and the engineer is to negotiate with the company as to the amount to be paid on account of expenditure incurred by the Corporation.

Halifax.—LOAN FOR EQUIPMENT.—The Town Council has applied for sanction to a loan of £13,887 for cables, booster transformer and switchgear required in connection with the bulk supply to Hebden Bridge.

Hull.—ANNUAL REPORT.—Perhaps the most striking item in the annual report of Mr. J. N. Waite, the general manager and engineer, is the table which gives statistics for the past six years. This reveals that, while the revenue of the Department has increased by 75 per cent., the rates paid have risen by 438 per cent. In spite of this the cost per kWh has been lowered by 7½ per cent. The number of additional connections made during 1934-35 was 8,389, bringing the total to 75,115. Of these, the last six years have accounted for 51,481. An increase of 55 per cent. over the previous year's figures is recorded for the number of cookers installed, the total reaching 8,673 (4,118 "Junior" models and 3,197 of the "small" type). Water-heaters and wash-boilers connected numbered 467 and 1,677 respectively.

Kent.—HOSPITAL LIGHTING EXTENSION.—The County Public Assistance Committee has arranged with the Kent Electric Power Co., Ltd., for the extension of the electric lighting installation at the Medway Hospital, Chatham, at a cost not exceeding £1,000.

Kingston-upon-Thames. — HOSPITAL INSTALLATION.—Tenders are to be invited by the Surrey County Council for the improvement of the supply (£2,000) and for the installation of electric lifts (£1,500) at the Kingston Hospital.

Liverpool.—CABLE EXTENSIONS.—The Electric Power and Lighting Committee is to extend the existing cables at an estimated cost of £6,650 for supplying the Speke industrial area. A new high-voltage feeder is to be laid from the Aintree sub-station to the Hall Lane kiosk on the Liverpool to Ormskirk Road for the purpose of distributing energy to the Maghull, Lydiate, and Aughton districts. The estimated cost is £4,950.

ANOTHER PROGRESSIVE YEAR.—Reporting the progress of the undertaking for the year ended March 31st last, Mr. P. J. Robinson, the city electrical engineer, states that the Clarence Dock power station was operated for only thirty-four hours longer than during the previous year, yet the output rose from 284,428,370 to 346,368,200 kWh, there being a net export to the grid of 150,952,000 kWh. The number of consumers at the end of March last was 123,477 (an increase of 16,481), and progress continues to be made in the use of domestic apparatus, over 12,340 cookers being now rented out by the Department.

Malvern.—NEW CABLES.—The Urban District Council is to lay feeders at an estimated cost of £1,009 to strengthen the cable network.

Manchester.—SALES DURING JUNE.—Figures issued by the Electricity Department show that applications for a supply during June numbered 1,480 from new consumers and 579 from existing consumers (additional supplies), representing a total of 4,363 kW. There were 194 orders for hired cookers, 17 for washboilers, and 63 for water heaters, the respective totals on circuit at the end of the month being 15,013, 821 and 1,181.

CONCESSIONS.—In view of certain economies which can be credited to the assisted wiring and the prepayment meter schemes, the Electricity Committee is of opinion that the charges can in both cases be made easier for the consumer. As lamps are now available at a low price it is considered that there is not the same necessity for including them in the assisted wiring installation. The Committee is also of the opinion that the rates paid to contractors can be amended so that the cost of installations will be reduced by approximately 5 per cent. It would thus be possible to reduce the prepayment wiring scheme charge from 7d. to 6d. per kWh, and that to prepayment meter users without the provision of wiring to 4½d. per kWh (instead of 5d.). The flat rate is 4½d. per kWh.

Mansfield.—METERS, MAINS AND SERVICES.—The Electricity Committee is seeking sanction to borrow £10,000 for meters and £20,000 for mains and services.

Marlborough.—CHANGE-OVER.—The Town Council is to proceed with a change-over scheme at an estimated cost of £17,700.

Middlesbrough.—SUPPLY TO FACTORY.—Messrs. Sadler & Co., Ltd., are extending their electrically operated machinery. The Town Council will provide an e.h.v. cable and supply the necessary transforming and control equipment in order to provide a supply at the Cargo Fleet Road side of the company's works. Messrs. Sadler will build the sub-station.

Nelson.—RURAL SUPPLIES.—The Corporation has informed the Burnley Rural District Council of its intention to apply to the Electricity Commissioners for an order authorising it to supply in Newchurch, Barley and Roughlee. The Lancashire Electric Power Co. has applied to the District Council regarding the extension of cables at Higham.

Newcastle.—CHEAPER ELECTRICITY.—Recommendations for lower electricity charges have been approved by the Town Council. The peak water-heating charge will be ¼d. (instead of ¾d.) per kWh, and the greenhouse heating tariff will be ¾d. per kWh for the first 480 kWh per quarter, ½d. for the next 960 kWh, and ¼d. above 1,440 kWh per quarter.

Perth.—LOWER CHARGES.—The Corporation is recommended to make concessions to electricity users, the new scales of charges for lighting being: Up to 5,000 kWh per quarter, 2½d. per kWh.; over 5,000 kWh, 1½d. per kWh.; heating rates, from ¾d., less 10 per cent., to ¾d. per kWh. The new scale of charges for power is: ¾d. per kWh up to 8,000 kWh per annum; up to 30,000, at 0.5d.; up to 80,000, at 0.4d.; and over 80,000 kWh, at 0.3d. per kWh. Further concessions are reductions of the meter charges from 25s. to £1 for lighting and from £2 to £1 15s. for heating and power.

Plymouth.—DEVELOPING DOMESTIC COOKING.—The Electricity Committee has revised charges in order to extend electric cooking, and is to appoint a cookery demonstrator.

ELECTRICITY FOR SCHOOLS.—Electric lighting is to be installed in the Salisbury Road and Stuart Road schools.

CHANGE-OVER.—The Electricity Committee is to effect a change-over in the St. Budeaux area at a cost of £2,000.

Portslade.—STREET LIGHTING.—The Council has approved a scheme for electrically lighting Old Shoreham Road, Victoria Road, Station Road, Carlton Terrace, Trafalgar Road, Church Road and Wellington Road. The Brighton Corporation is to carry out the work.

Salford.—EXTENSION OF SUPPLY.—The Lighting Committee is seeking an order to supply electricity to 49 houses on the Sheepfoot Lane estate in the Manchester supply area.

Scarborough.—REVISED CHARGES.—As from the June meter readings the "unit" charge under the "two-part" tariff is being reduced from ¾d. to ½d. Hotels, boarding houses and apartment houses which are normally or partially closed in the winter months are, under a new ruling, allowed to take supplies of electricity on the two-part tariff system from April 1st to September 30th, and on the flat-rate system from October 1st to March 31st. Electric water heaters are being let out on hire, subject to the consumers concerned entering into an agreement to hire them for not less than five years at a rental of 4s. 6d. per quarter for each heater, the consumer to pay for all wiring in excess of 30ft.

Southend-on-Sea.—AUTUMN ILLUMINATIONS.—The autumn illuminations are to be formally switched on by Sir Harry Brittain on Monday evening next.

Traction

Belgium.—TROLLEY-BUS SERVICE.—An arrangement has recently been made between the Societé Nationale des Chemins de Fer Vicinaux and the municipal authorities of Malines for the establishment of a service of electric trolley-buses between Muysen and Battel, on the outskirts of Malines, the length of the route being about 3½ miles.

France.—FURTHER RAILWAY ELECTRIFICATION.—The electrification of several additional sections of the Midi Railway has recently been completed, including the lines between Vierzon and Brive and between Bordeaux and Pointe-de-Grave. By the end of the present year it is anticipated that 1,164 miles of the Midi system will have been converted to electric traction as against 996 miles at the close of 1934.

London.—TRAMCAR MODERNISATION.—Extensive structural improvements are to be carried out on 250 of the London Passenger Transport Board's tramcars at a cost of £100,000. It is expected that others on the Central London routes will be re-equipped in due course. The cars will have upholstered seats, linoleum floors, new lighting, electric bell-pushes, and better protection for the driver.

Middlesbrough.—FUTURE OF THE TRANSPORT UNDERTAKING.—The future of the Tees-side Railless Traction Board is being considered by a committee, and it is understood that two suggestions have been made, namely, that the undertaking should be acquired and controlled by the Town Council, or that it should be transferred to a private company. At present the Board is controlled jointly by the Middlesbrough and Eston Councils.

Plymouth.—TROLLEY-BUS POSSIBILITIES.—The Transport Committee is to obtain a report as to the practicability of converting two tram routes to trolley-vehicle operation.

South Shields.—WELDING THE TRAM TRACK.—Stretches of tram track are to be welded at a cost of £714 to secure quieter running and cheaper maintenance.

Communications

Australia.—OVERSEAS WIRELESS SERVICES.—The Australian Government intends to take legal proceedings against Amalgamated Wireless (Australasia), Ltd., to determine to what extent the agreements between the Federal Government and the company, by which the company controls the overseas wireless services, are binding on the Commonwealth and upon what terms they may be varied. The object is to obtain a definition of the manner in which the Government could resume control of these services should it decide to do so. The first agreement was made by the Hughes Ministry, and a second was made by the Bruce Ministry to substitute the short-wave beam service for the long-wave service. The point at issue is whether these agreements, taken together, give the company a perpetual charter to operate the services. Important extensions of the overseas wireless services may depend on the result of the proceedings. The establishment of a wireless telegraph service between Australia and the East, and between Australia and parts of the United States not already served by the beam link with Canada, is under consideration.

Great Britain.—TELEVISION.—The British Broadcasting Corporation has been authorised by the Postmaster-General to arrange with the Baird Television and the Marconi-E.M.I. Television companies for the provision of complete transmitting sets for the operation of their respective systems at the Alexandra Palace, London, N. It is expected that the first test transmissions will take place early next year, and that they will be followed, as soon afterwards as practicable, by a regular public service. Assurances are being sought from the companies concerned that licences to use the companies' patents in this country will be obtainable by any responsible manufacturer of television receiving sets on payment of reasonable royalties.

WIRELESS LICENCES.—During July 266,190 wireless licences were issued, representing a net increase of 26,610, and raising the total in force to 7,146,050, as compared with 6,393,779 a year ago.

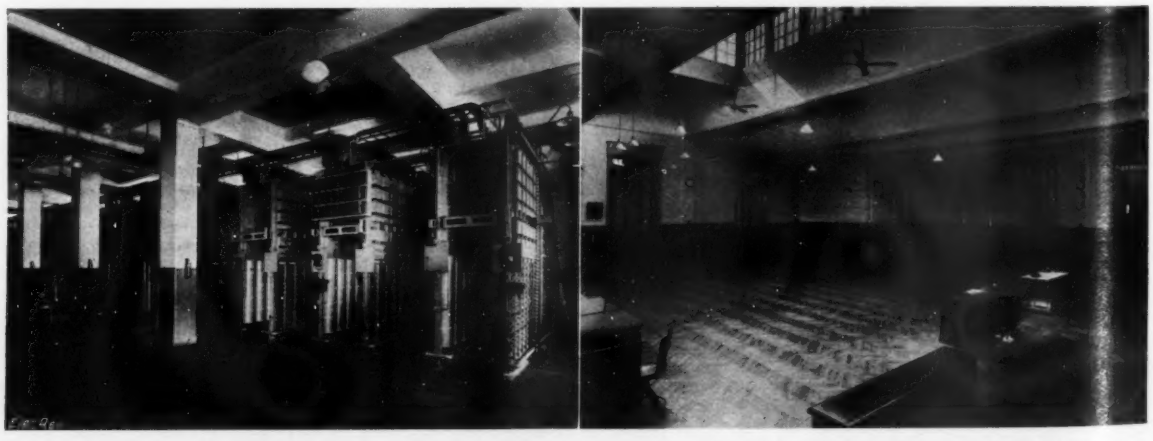
EMPIRE BROADCASTING.—A 39-page booklet entitled "The Empire Broadcasting Service" has been published by the British Broadcasting Corporation. Sections are devoted to the history of the service, programmes, and technical data.

A LARGE TELEGRAPH TRAFFIC INCREASE.—When the charge for telegrams was reduced on May 31st the average number of messages was 160,000 per day at the Central Telegraph Office. Last Saturday the number was 259,707, which is the highest number recorded since the outbreak of the war.

Norway.—SHORT-WAVE TELEPHONE.—A new wireless station in course of construction at Jeloeya, Norway, states *Reuter's Trade Service*, quoting the *Handels og Sjoefartstidende*, will have a power of 25 kW and use a wavelength between 3,000 and 8,000 metres. Wireless telephony experiments are also being conducted with waves of 6 or 7 metres. Satisfactory results have been obtained comparatively high above sea level, and further experiments will be made with stations only a little above sea level. The purpose of these experiments is to provide telephonic communication with islands and across fjords.

Russia.—DEVELOPING COMMUNICATIONS.—According to the *Moscow News*, the Council of the People's Commissars has ordered the development, by the Communications Commissariat and the State Planning Commission, of an elaborate plan for the expansion of electrical communications during 1936 and 1937. For improving wireless communications a system of main, relay and regional stations will be established, and equipment will be standardised. Radio telephones and radiograms will be used more extensively, and automatic telephone stations will be universally established. In five years the number of telephones in the collective farm villages is reported to have increased by 250 per cent.

Switzerland.—NEW TELEGRAPH CABLE.—As a result of the electrification of the railways in the Birse Valley the Swiss Telegraph authorities have recently found it necessary to replace the overhead telegraph lines in the district by an underground cable. So far it has been laid between Bienne and Delemont. Between the first-named town and Corgemont the cable comprises 102 conductors, and between Corgemont and Delemont 68 conductors.



The first line finder with final selector racks and (right) the manual room at the new Alexandria automatic telephone exchange

Egypt.—ALEXANDRIA'S AUTOMATIC TELEPHONES.—The automatic telephone exchange which was put into service on July 22nd at Alexandria, Egypt, has equipment for 10,000 subscribers, and there is capacity in the building for a further 10,000 lines when required. The type of plant installed is the rotary system of Standard Telephones & Cables, Ltd., in which the switch mechanisms are operated by continuously rotating shafting driven by small motors working from the electricity supply mains. For the control of switching apparatus a battery of accumulators is installed, this being charged from the mains or from a petrol engine. In the event of a failure in the main supply to the exchange the small driving motors will be automatically connected to the accumulator battery. Although all calls between subscribers in Alexandria are completed without the intervention of an operator, for the purpose of answering inquiries and handling trunk calls three switchboards are provided with accommodation for forty-two telephonists. In order to provide protection from the moist salt-laden air which is characteristic of the city a complete air-conditioning plant has been installed in the buildings.

United States.—TELEVISION CABLE BETWEEN NEW YORK AND PHILADELPHIA.—The installation of a co-axial cable between New York and Philadelphia by the American Telephone & Telegraph Company for experimental television and multiple telephone and telegraph services has been authorised by the Federal Communications Commission, says a *Reuter's Trade Service* message from New York. The cable will transmit 240 telephone messages simultaneously in each direction, or 2,400 telegraph messages. Television images can be transmitted when the cable is not otherwise in use, but not when voice or electrical impulses are being transmitted.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Argentina.—BUENOS AIRES.—September 9th. State Railways. Electric generating sets, rotary pump, electric motors, switchboards, &c. (T.Y. 5100.)*

September 24th. National Sanitation Works Department. Electric generating sets and pumping sets. (T.Y. 10030.)*

Australia.—MELBOURNE.—State Electricity Commission of Victoria. November 11th. Four water-tube boilers for the Yallourn power station. Agent-General for Victoria, Victoria House, Melbourne Place, W.C.2 (deposit £6 6s.).

Beckenham.—August 26th. U.D.C. Steel lamp columns. (August 9th.)

Bedfordshire.—August 19th. County Council. Heating and hot water supply and electric lighting and wiring at the new Council school, Stewartby. O. P. Milne, 64, Wigmore Street, London, W.1.

Bexhill.—August 23rd. Electricity Department. Collection, conversion and re-installation of d.c. wireless apparatus. (August 9th.)

Brighton.—August 19th. Corporation. Switchboard. (August 2nd.)

Bristol.—September 18th. Town Council. Reconstruction of St. Philip's refuse disposal plant with metal and dust extraction and steam raising and electric generating plant. H. M. Webb, City engineer, 63, Queen Square (deposit £2 2s.).

Congleton.—August 23rd. Electricity Department. 500-kVA transformer. (August 2nd.)

Conway.—August 19th. Electricity Department. 500-kVA transformer. (August 9th.)

Dunfermline.—August 26th. Town Council. Various works, including electrical, at new maternity hospital. C. R. Douglas & Son, Prudential Chambers, East Port (deposit £1 1s.).

Edinburgh.—August 24th. City Council. Vehicle-actuated traffic signals. (August 9th.)

Egypt.—CAIRO.—September 5th. Ministry of the Interior. Electrical plant and equipment, including Diesel engines, switchgear, pumping sets, machine tools and crane for power station at El Arish. (T.Y. 10028.)*

Glasgow.—August 21st. Cleansing Department. Seven electric traction batteries. Director of cleansing, 20, Trongate.

Greenock.—Managers of the Rankin Memorial Hospital. Various work, including electrical, in connection with the erection of a maternity and children's hospital. Particulars from J. C. Smith, Macdonald & Crawford, 26, Hamilton Street, by August 21st.

Heston & Isleworth.—September 2nd. Electricity Department. Transformer, on-load tap charging equipment, 11,000-V truck type cubicle and l.p. feeder panels. (See this issue.)

India.—BOMBAY, BARODA & CENTRAL INDIA RAILWAY CO.—August 28th. Sub-station equipment and track sectioning switchgear. (August 2nd.)

London.—STOKE NEWINGTON.—Electricity Department. Conversion to a.c. of existing d.c. motors, starters and wiring at three factories. (August 9th.)

FULHAM.—September 16th. Circuit-breakers and 6,600-V and 400-V cable. (See this issue.)

Manchester.—August 22nd. Education Committee. Electric lighting at the Yew Tree Municipal Senior school, Wythenshawe. Surveyor's Department, Education Offices, Deansgate (deposit £1 1s.).

Middlesbrough.—September 16th. Electricity Department. Static transformer. Borough electrical engineer, Snowdon Road.

New Windsor.—August 26th. Town Council. Vehicle-actuated street traffic control signals. F. N. McRae, Borough engineer, 16, Alma Road, Windsor.

New Zealand.—WELLINGTON.—Public Works Tenders Board. November 19th. Three 1,667-kVA outdoor type transformers. (T.Y. 10009.)*

Posts and Telegraph Department. October 2nd. P.i. l.c. telephone cable. (T.Y. 10006.)*

October 14th. 2,000 wall pattern magneto telephones. (T.Y. 10007.)*

Public Works Department. October 29th. Three 50-kV outdoor type potential transformers. (T.Y. 10008.)*

Oswestry.—August 31st. Electricity Department. E.h.p. truck-type cubicle and a complete e.h.p. transmission line. (See this issue.)

Plymouth.—September 7th. Corporation. L.p. distribution boards. (See this issue.)

Ross and Cromarty.—County Council. Electric lighting, heating, &c., at Nicolson Institute, Stornoway. D. Matheson & Son, architects, Dingwall.

St. Andrews.—August 27th. Town Council. Electrical work in connection with alterations at Kinburn House. Walker & Pride, chartered architects, Church Square (deposit £1 1s.).

Salford.—August 22nd. Electricity Department. Electric vehicle. (August 9th.)

Seisdon.—August 23rd. R.D.C. Electrically driven pumping plant consisting of two motors and vertical spindle pumps for pumping sewage at Lane Green Road, Codsall. Willcox, Raikes & Marshall, 33, Great Charles Street, Birmingham (deposit £2 2s.).

Slaithwaite.—August 19th. Electricity Department. 11,000-V e.h.p. cables. E. Freeman, clerk to the Council, Town Hall (deposit £2 2s.).

Sleaford.—August 19th. Mental Hospital Joint Visiting Committee. Electrical installation at Rauceby Mental Hospital. (August 9th.)

Southampton.—August 27th. Electricity Department. Transformers, switchgear and cable. 11,000-V, 6,600-V and 1,000-V cables. (See this issue.)

Standish-with-Langtree.—August 17th. U.D.C. Street-lighting equipment. (August 9th.)

Sunderland.—September 2nd. Electricity Department. Cable, wire, meters and lamps. (August 2nd.)

Swansea.—September 2nd. County Council. Wiring for electric lighting, heating, power and signalling systems in the access galleries to storage tanks and in the screening house at Mumbles. Office of the Chief Engineer, J. Richard Heath, Guildhall (deposit £2).

Warrington.—September 2nd. Electricity and Tramways Committee. E.h.p. sub-station switchgear. (August 9th.)

West Ham.—August 26th. Electricity Department. Meters, transformers, wires and cables. (August 2nd.)

Wolverhampton.—August 30th. West Midlands Joint Electricity Authority. 33,000-V cable. (August 9th.)

Yorkshire.—August 26th. West Riding County Council. L.p. hot water apparatus and electric lighting at the extensions of Conisborough senior council school and the Normanton new senior school. Education officer, County Hall, Wakefield.

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Australia.—COMMONWEALTH.—P.M.G.'s Department. Accepted. Automatic telephone switching equipment (£24,422).—Automatic Telephones, Ltd. Paper jointing sleeves (£218).—British Insulated Cables, Ltd. Induction coils and registers (£437).—British General Electric Co., Ltd. Valves for broadcasting stations and studios.—Standard Telephones & Cables (A'sia), Ltd. (£2,807); Philips Lamps (A'sia), Ltd. (£2,705); British General Electric Co., Ltd. (£715). Primary battery material (£776).—Siemens (Aust.) Pty., Ltd. Accumulator plates and separators.—Tudor Accumulator Co., Ltd. (£1,263); Exide Batteries of Aust., Ltd. (£1,026).

MELBOURNE.—City Council. Accepted. Metal-clad switchgear for equipping two static sub-stations (£4,923).—A. Reyrolle & Co., Ltd. Fuses and replacements (£1,076).—Siemens (Aust.) Pty., Ltd.—*Tenders.*

Brierfield.—Electricity Committee. Accepted. H.p. kiosk (£263).—Crompton Parkinson, Ltd. Sub-station cubicle (£178).—Metropolitan-Vickers Electrical Co., Ltd.

China.—Ministry of Industries. Three 10-ton electric overhead cranes.—Sir William Arrol & Co., Ltd.

Government Purchasing Commission. Accepted. Plant for the Canton-Hankow railway: Switchboard and accessories.—General Electric Co., Ltd. Horizontal water-tube boiler.—Babcock & Wilcox, Ltd.

Coulsdon.—U.D.C. Accepted. Fire alarm system (£1,986).—Automatic Electric Co., Ltd.

Highways Committee. Accepted. Illuminated street refuse bollards (£8 15s. each).—Yorkshire Switchgear & Engineering Co., Ltd.

Dover.—Town Council. Accepted. Domestic apparatus in connection with the change-over (£1,337).—Collins Electrical, Ltd. Motors (£663).—Briggs Motors, Ltd.

Dundee.—Education Committee. Accepted. Electric lighting in the Rockwell Primary school extension (£166).—J. Mackersie & Co.

Egypt.—State Railways. Accepted. Cable.—British Insulated Cables, Ltd. (£289); Ericsson Telephones, Ltd. (£219). Signalling materials.—Stewarts & Lloyds, Ltd. (£697); Westinghouse Brake & Signal Co., Ltd. (£2,131).

Huntly (ABERDEENSHIRE).—Lighting Committee. Accepted. Electric street lighting equipment (£757).—Alexander Dey.

India.—Stores Department. Accepted. Junction and fuse boxes.—Mather & Platt, Ltd. "Exide" batteries for electric locomotives.—Chloride Electrical Storage Co., Ltd.

New Zealand.—AUCKLAND.—Harbour Board. Accepted. Four electric cranes (£14,689).—Cowans Sheldon & Co., Ltd.—*Tenders.*

Rawtenstall.—Electricity Committee. Accepted. Electric vehicle.—Partridge, Wilson & Co., Ltd.

Rutland.—Mental Deficiency Committee. Accepted. Electricity services at Stretton Hall Institution (£580).—T. H. Wathes & Co., Ltd.

Salford.—Transport Committee. Accepted. Trolley wire.—Frederick Smith & Co. (£287); British Insulated Cables, Ltd. (£285).

Smethwick.—Housing Committee. Accepted. Electrical installations at Council houses (£225).—B. French, Ltd.

Spalding.—U.D.C. Accepted. H.p. cable for improving the distribution system at Surfleet (£282).—Pirelli-General Cable Works, Ltd.

Notes

Generation of Electricity in July

The official returns rendered to the Electricity Commissioners show that 1,216 million kWh of electricity was generated by authorised undertakers in Great Britain during July, as compared with the revised figure of 1,042 million kWh in the corresponding month of 1934, representing an increase of 174 million kWh, or 16.7 per cent. The number of working days in the month (i.e., excluding Sundays) was 27 as against 26 last year.

During the first seven months of 1935 up to the end of July the total quantity of electricity generated by authorised undertakers was 9,718 million kWh, as compared with the revised figure of 8,674 million kWh for the corresponding period of 1934, representing an increase of 1,044 million kWh, or 12.0 per cent.

	1934. kWh. (millions).	1935. kWh. (millions).	Increase per cent.
January	1,536	1,714	11.6
February	1,343	1,478	10.0
March	1,391	1,507	8.3
April	1,188	1,330	11.9
May	1,125	1,326	17.9
June	1,049	1,147	9.3
July	1,042	1,216	16.7

Aircraft Radio Research

The Civil Aviation Department of the Air Ministry has, according to *The Times*, asked for the assistance and co-operation of the National Physical Laboratory in an attempt which is to be made (i) to devise means of assisting aircraft to land on aerodromes obscured by fog, or under conditions of poor visibility; (ii) to enable short-wave direction-finders to be used over long ranges; and (iii) to involve a radio device for warning aircraft under poor visibility conditions, or near tall obstructions, such as radio aerial masts.

For these purposes a monoplane is to be equipped with special testing apparatus by the Air Ministry, which has ordered an "approach" beacon with a range of 20 to 25 miles to radiate a short aural note, and two or more "marker" beacons will also probably be used.

Machines of Imperial Airways, Ltd., may be invited to transmit short-wave test signals at prearranged times over long ranges, while experiments are likely to be made at the Croydon, Gatwick, and Gravesend aerodromes.

Surrey Arbitration Case

Surrey Valuation Committee has authorised the appointment of Mr. Lionel Monkton, K.C., to arbitrate upon the value of the mains in Surrey of the Metropolitan Electric Supply Company, and has authorised Mr. Gerald Eve to be consulted and instructed to act for the North Western Area Assessment Committee in connection with the preparation and presentation of the case before the arbitrator.

Chicken Brooding by Electricity

In the course of the paper which he read at the conference held at the recent Royal Lancashire Show, Burnley, referred to in our last issue, Mr. A. Paull, of Aughton, stated that the use of electric heat in the brooding of chickens is gaining favour. There are various methods of distributing the heat in the electric brooders, such as hot plates, radiators, small electric fires and by means of carbon lamps, the latter being the most popular—16 and 32 c.p. carbon lamps are the sizes most commonly used. These lamps are fixed in the brooder in such a manner that the heat is distributed over the backs of the chickens. One hundred chickens can be brooded for a period of four weeks at a cost of about ¾d. per chick (with electricity at 1d. per kWh). Mr. Paull also mentioned the beneficial properties of artificial sun-ray lamps for preventing leg weakness in chickens.

Electric lighting in poultry cabins during the winter months as a means of inducing increased egg production is widely used in Lancashire. A number of tests carried out with pullets showed that birds given a twelve- to thirteen-hour day during the winter months by means of electric light, produced an average increase in eggs of 25 per cent. over "unlighted" birds.

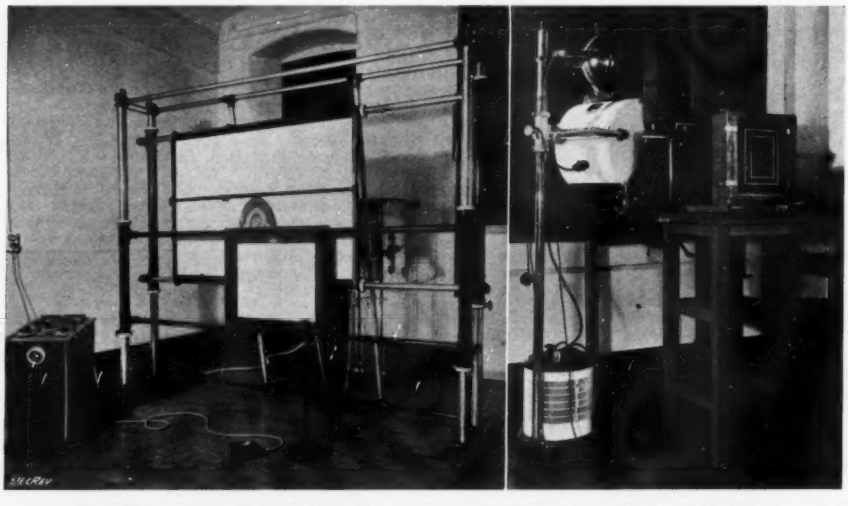
Rural Electricity Tariffs

A review of farm electricity tariffs is contained in Volume 2 of "Farm and Machine" (2s. 6d.), published by the Institute for Research in Agricultural Engineering, Oxford University. In order to ascertain the types and amounts of the tariffs charged in different rural areas a request for schedules was made to a number of undertakings, which were then asked to assess their charges to a hypothetical farm, the conditions and consumptions of which were specified. The results were applied to a farm near Oxford, the rateable value of the house being £30 and of the farm buildings £30 (estimated).

For the house nine undertakings showed an average cost below 2d. and all but one (Brighton) was below 3d. per kWh. In the case of the farm Liverpool and Chester, both on the rateable-value basis, showed a figure of less than 1d. per kWh. Bedford came next with 1d. per kWh., but the general feature of this section was the reversal of order as compared with house-supply charge. On the basis of overall cost Liverpool (0.91d.), Chester (1.08d.), Bedford (1.12d.), Portsmouth (1.16d.), and the Lancashire Electric Power Co. (1.19d.) have the most favourable tariffs.

Radiography at the National Gallery

The trustees and director of the National Gallery, Trafalgar Square, London, decided about a year ago to establish a physical laboratory at the gallery for the examination of pictures. The necessary equipment has recently been completed and is now in use. It is strictly limited to work within the gallery.



The X-ray equipment (left) and u.v. ray apparatus at the National Gallery

The electrical installation consists of an X-ray plant and ultra-violet apparatus. The former comprises a standard unit especially adapted for working at low kilovoltages and includes both screening and radiographic arrangements. The picture under test is supported upon a specially designed easel providing appropriate movements and safety devices. The ultra-violet lamp has been modified to illuminate an area of one square yard; with it is associated a "Restlight" lamp, in order to be able to switch over rapidly for visual observation from ultra-violet to daylight illumination. Photographs are taken by the fluorescent radiation.

Smoke Abatement

Nearly one hundred municipal authorities and important bodies connected with the gas, electrical and solid fuel industries, will be represented at the seventh annual conference of the National Smoke Abatement Society which is to be held at Bristol from September 19th to 21st. The conference is to devote a special session to the question of smoke abatement and the coal industry, and it is anticipated that important recommendations regarding the use of raw coal will be made. Special consideration is also to be given to smokeless equipment in housing schemes, the emission of dust and grit from industrial chimneys, and the effect of smoke drift on the countryside.

Low-loss Insulating Material

One of our readers wishes to discover manufacturers in this country of "low-loss" insulating material for high frequency work at 2 to 3 metres wavelength, with electrical and medical characteristics corresponding to those of such Continental products as "Ultra-Calan," "Frequenta-D" and "Trolitul."

Appointments Vacant

Meter tester and repairer for Southampton Electricity Department.

Meter and installation assistant for Basingstoke Electricity Department.

Clock-maker or instrument mechanic for Lincoln Electricity Department.

Temporary draughtsman for Carlisle Electricity Department.

Temporary assistant mechanical and electrical engineers for the Air Ministry.

Storekeeper for Swansea Electricity Department.

Junior mains engineer for the Kirkcudbright County Council.

(See our classified advertisements.)

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. C. S. Robson has resigned the chairmanship of Messrs. Hick, Hargreaves & Co., Ltd., but retains his seat on the board. **Mr. W. D'Arcy Madden,** managing director of the company, has been elected chairman.

[*Elliott & Fry*
Mr. W. D'Arcy Madden

Mr. H. Hobson, B.Sc., A.M.Inst.C.E., M.I.E.E., general manager of the Central Electricity Board, has accepted an invitation by the Board of Control to be the president of the Association of Supervising Electrical Engineers for the forthcoming year, and will take office in October next. **Mr. J. M. Kennedy,** M.Inst.C.E., M.I.E.E., the retiring president, who was recently elected president of the Institution of Electrical Engineers, will introduce Mr. Hobson at the Association's meeting on October 15th, when the new president will deliver his inaugural address.

Mr. A. R. Ubbelohde, B.A., B.Sc., formerly Senior Scholar of Christ Church, Oxford, and at present holder of a senior research award of the Department of Scientific and Industrial Research, has been awarded the Dewar Research Fellowship by the managers of the Royal Institution. Mr. Ubbelohde will take up his new appointment in the autumn. His researches have been largely in physical chemistry, and it is expected that his experience will be valuable in connection with the researches at the Royal Institution on the structure of matter directed by Sir William Bragg.

Mr. R. P. Lowe, who has been telephone sales manager in the Newcastle-on-Tyne area for eight years, has been appointed to a similar post at Birmingham, and took up his new duties on August 12th. While he was at Newcastle the number of telephones in the area increased from 32,000 to 46,000. Mr. Lowe has been associated with telephone development for thirty-eight years, starting in 1897 with the National Telephone Co.

A.S.E.E. Awards.—The judges of the meetings discussion award have submitted their report to the Association of Supervising Electrical Engineers, which has awarded the first prize (value £5) to Mr. L. W. Medcalf, and the second prize (value £2 10s.) to Mr. W. Acton.

Mr. G. L. E. Metz, A.M.I.E.E., who was recently presented with a folio case and a cabin trunk on leaving the Metropolitan-Vickers Electrical Co., Ltd., is to take up the position of chief engineer in Australia and Tasmania to the Asea Electric, Ltd.

Mr. Samuel Insull's name has been restored to the pension rolls of four of the principal companies in the former Insull utilities group.

Mr. B. Lowe has been selected by the Ashton-under-Lyne Electricity Committee as constructional engineer on probation for six months.

Mr. G. E. W. Soulsby, electrical engineer of the Tanfield (Durham) Urban District Council for some years, was married at Dipton last week to Miss M. I. Randall.

Mr. S. Maddocks, Commissioner for Road Transport and Tramways in South Wales, will visit this country shortly to investigate the latest developments in city transport, traffic regulations and facilities, signals, &c. He will also examine improvements in the construction and design of tramcars, trolley buses, and other public service vehicles. The result of his investigations will largely determine the State Government policy on a proposal to spend £1,000,000 on the improvement of the Sydney transport system.

Mr. J. A. Scott, a member of the staff of the British Thomson-Houston Co., Ltd., Birmingham, and formerly of Messrs. A. Reyrolle & Co., Ltd., was married recently to Miss Catherine Aynsley.

Mr. Hugh Roberts was successful in obtaining the premier award for a technical essay at the Royal National Eisteddfod of Wales, held at Caernarvon last week. This is the sixth occasion on which he has won the first prize for essays on scientific subjects at this festival. He is at present on the staff of the Northampton Electric Light and Power Co., Ltd.

Mr. J. Garty, formerly assistant engineer to the Clyde Valley Electrical Power Co., and latterly with the Birmingham Corporation Electric Supply Department, has now joined the staff of the Glasgow Electrical Engineering Co., Ltd.

Sir Charles Carpendale has been appointed Deputy Director-General of the British Broadcasting Corporation, and **Mr. B. E. Nicholls** succeeds him as Administrative Controller. These appointments are due to the reorganisation of the higher offices of the B.B.C. and the creation of the New Television Department.

Obituary

Mr. C. M. Sprigg.—The death occurred on August 4th at the Birmingham General Hospital after a long illness of Mr. Charles M. Sprigg, of Adelaide, aged twenty-six. He was the only son of Mr. C. A. M. Sprigg, secretary of the Adelaide Electric Supply Co., Ltd., and in 1930, having won the Angas Engineering Scholarship awarded biennially by the Adelaide University, he came to England and spent the next three years with the General Electric Co., Ltd., and with Messrs. A. Reyrolle & Co., Ltd., afterwards entering the service of the North Wales Power Co., Ltd., with whom he remained until overtaken in March last by the illness which has ended fatally.

Mr. O. Moller.—The death is announced in *Eastern Engineering and Commerce* of Mr. Oscar Moller, who spent nearly sixty years in China. He went to that country in 1875, in the employ of the Great Northern Telegraph Co., and was one of the engineers engaged on the construction of the Tientsin-Shanghai landline. He resigned from the Great Northern Co. in 1883, and then made a survey of the Hankow-Canton landline, his greatest task being the laying of the submarine cable between the mainland and the island of Hainan.

Wills.—Sir George A. Touche, Bt., chairman of a number of companies, including the Sphere Investment Trust, and a director of the Atlas Electric and General Investment Trust, left £187,286, with net personalty £182,237.

Mr. W. G. Haslam, at one time director of the Haslam Foundry and Engineering Co., Ltd., left £42,895 (net personalty £40,780).

Two views of the Radio Exhibition now in progress at Olympia (See page 207). On the left is a group of exhibitors' offices in rather novel architecture. The other picture is a general view showing the large illuminated background

East Perth (W.A.) Power Station Extensions

THE Western Australian Government has awarded contracts for the extension to the East Perth power station consisting of three 100,000-135,000 lb. boilers, one 25,000-kW turbo-alternator, and h. and l.p. switchgear, at a total cost of approximately £400,000.

The boiler contract covers not only the steam raising plant, but a steel building with reinforced concrete walls. The main contractors for the boiler house plant are International Combustion, Ltd., and the boilers will be fired by powdered coal on the "Lopulco" system.

As the extension will form virtually a new power house, the opportunity has been taken to use a steam pressure at the turbine of 650 lb. per sq. in. with steam super-heated to a final temperature of 800-835 deg. F. The control of the steam temperature will be by means of the Superheater Co.'s system of automatic control, the same company also supplying the superheaters themselves. To take care of any dust emission from the chimneys, each boiler is equipped with a Lodge-Cottrell electrostatic dust precipitator.

The boilers will be fired by unit mills of which there will be two per boiler, each capable of dealing with the full output in case of emergency. Particular attention has been given to centralising the control, and for each boiler a George Kent and Co. panel is being provided which will take the form of a flat-backed board and inclined desk. On these panels in addition to the instruments will also be grouped all the electrical control switches for the auxiliaries of each boiler, also the unit switchgear supplying their respective boiler units.

For the control of speed Vulcan-Sinclair hydraulic couplings are being used, and these also, so far as the controls are concerned, are grouped on the Kent board. To provide complete centralisation of the control system, contactor starters with operating switches are mounted on the desk portion of the above-mentioned boards. The economisers will be of the Heenan twin-tube type with vertical gas passages, and the air heaters of the plate type manufactured by International Combustion, Ltd., of the "Usco" design. Special attention has been paid to prevent corrosion, and for this purpose a proportion of the flue gases are by-passed so that the temperature will always be well above the dew point. A complete coal and ash plant by International Combustion, Ltd., is being provided, and with regard to the former the present bunkers are being utilised with a considerable saving in the cost of civil work to the Government.

The turbine, this is being supplied by Messrs. C. A. Parsons and Co., Ltd., and will generate three-phase 6,300-V a.c. at a frequency of 40 cycles. It will be supplied with condensing plant of the company's manufacture. The saving in cost of intake works has been made by adopting Vickers-Gill circulating pumps which will be supplied by Vickers-Armstrongs, the same company also providing the evaporators and de-aerators.

The same principle has been adopted in connection with the turbine as in the case of the boilers, so far as centralised control is concerned, and a turbine board will be erected in the turbine room on which all the controls will be grouped. The main steam valves are all electrically operated, and for this purpose a Hopkinson panel is being supplied to take care of the operation of the valve system.

The l.p. switchgear, which will be of the armourclad type both for the main l.p. equipment and the unit boards, will be electrically operated from a miniature control panel in the main power station control room. This, in addition to the operation of the switchgear, will also have remote indication of the condition of all contactor starters showing whether the motors are running or idle.

The l.p. cable system throughout the extension is being supplied by the Pirelli-General Cable Works, Ltd., Southampton, and the lighting of the power station has been designed and laid out by the General Electric Co., Ltd., with a view to providing up-to-date and modern illumination. The foundations and other local work will be carried out by the Government.

The following are the sub-contractors to International Combustion, Ltd.: Pipework, Aiton's; economisers, Senior Economisers, Ltd.; fans, Davidson & Co., Ltd.; electrostatic dust precipitators, Lodge-Cottrell, Ltd.; motors and starters, Metropolitan-Vickers Electrical Co., Ltd.; instruments, equipment, Geo. Kent & Co., Ltd.; aerators and evaporators, Vickers-Armstrong, Ltd.; and boiler mountings, Hopkinsons, Ltd.

The whole of the works are to the designs and specifications of the engineer and general manager of the Government Tramways, Electricity Supply and State Ferries Systems, Mr. W. H. Taylor, M.I.E.E., M.I.E.A., who has been in London since March in connection with the scheme. Mr. Taylor is returning to Perth (W.A.) by the *Ormonde*, sailing from Toulon on August 23rd.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Multiplex (Cardiff), Ltd.—Private company. Registered August 9th. Capital, £1,000 in 3,600 7 per cent. non-cumulative participating preference shares of 5s. each and 2,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers of and dealers in electric lamps of all kinds, &c. The subscribers are: R. N. T. Newman, 49, Wray Crescent, London, N.4, and E. O. Griffiths, 104, Priory Road, London, N.8. Registered office: Aldwych House, Aldwych, London, W.C.2.

Quadrant Metal Products, Ltd.—Private company. Registered August 10th. Capital, £2,000 in 1,500 ordinary shares of £1 and 10,000 deferred shares of 1s. Objects: To carry on the business of manufacturers, contractors, importers and exporters of and dealers in radio, radio products and apparatus, television apparatus, &c. The subscribers are: A. Sweet, 66, Victoria Street, London, S.W.1, and W. Bird Mills, 4, Royal Parade, Chislehurst, Kent. A. Sweet is secretary and signs documents as director.

Lunn's Radio, Ltd.—Private company. Registered August 10th. Capital, £300 in £1 shares. Objects: To acquire the business of radio and television engineer carried on by Harold J. Lunn at 13, West Street, Reigate, Surrey. The first directors are: H. J. Lunn, 13, West Street, Reigate, and Capt. Bertram J. Batt, St. David's, Gleys Road, Woodthorpe, Nottingham. Secretary: B. J. Batt. Registered office: 13, West Street, Reigate.

E. & H. P. Smith, Ltd.—Private company. Registered August 3rd. Capital, £30,000 in £1 shares. Objects: To acquire the business of radio wholesalers carried on by Ernest Smith and Harold P. Smith as "Midland Auto Components" at Cambridge Street, Birmingham, and also at London, Gloucester and Coventry. The permanent directors are: E. Smith, White Gates, Solihull; and H. P. Smith, "Hillfield," Liveridge Hill, Beaudesert. Registered office: Cambridge Buildings, Cambridge Street, Birmingham.

British Electryde Corporation, Ltd.—Private company. Registered August 6th. Capital, £5,000 in 20,000 shares of 5s. each. Objects: To carry on the business of manufacturers of and dealers in electric and other lamps and all component parts thereof, and electrical appliances, apparatus and equipment, &c. The subscribers are: B. C Bischoff, 4, Great Winchester Street, E.C.2; and F. Willis, 57, Creighton Avenue, N.10. Solicitors: Bischoff, Coxe, Bischoff and Thompson, 4, Great Winchester Street, E.C.2.

Microphone Equipment, Ltd.—Private company. Registered August 6th. Capital, £500 in 475 6 per cent. cumulative preference shares of £1 and 500 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers and repairers of and dealers in microphones, wireless and gramophone goods, &c. The permanent directors are: L. C. Curd, Dordamon, Hawks Hill Close, Fetcham, Surrey, and two others. Registered office: Faraday House, 8/10, Charing Cross Road, W.C.2.

W. E. George (Electrical), Ltd.—Private company. Registered August 6th. Capital, £500 in £1 shares. Objects: To carry on the business of electrical engineers and general electrical installation contractors, &c. The directors are: T. J. Meaker, 10, Hadley Avenue, Wallington, Surrey; V. F. Payne, 89a, Larden Road, W.3; and W. E. George, 16, Eaton Park Road, N.13.

Midland Radio Relay Services, Ltd.—Private company. Registered August 6th. Capital, £4,500 in 15,000 shares of 1s. and 3,750 shares of £1. Objects: To establish, maintain and develop a radio relay service in Rugby. The permanent directors are: H. Roughton, 139, Wellingborough Road, Rushden, and two others. Secretary: Arthur E. Limehouse. Registered office: 24, Market Place, Rugby.

Martin's Radio, Ltd.—Private company. Registered August 6th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of, agents for and dealers in radio and television and/or electrical goods and appliances, &c. The subscribers are: A. Wilson, 62, Myddelton Square, E.C.1; and H. C. Wisenden, 114, Hillside Gardens, Barnet. Solicitors: Zeffertt and Heard, 17, Coleman Street, E.C.2.

Stubbs & Kitchin, Ltd.—Private company. Registered August 2nd. Capital, £500 in £1 shares. Objects: To acquire the business of manufacturers of amplifiers and wireless and specialists in public address amplification and recording carried on by H. D. Stubbs and F. P. Kitchin at Hillside Works, 13, Otley Road, Harrogate, and at Vanderbilt Court Studios, 5, Victoria Avenue, Harrogate, as "Stubbs & Kitchin." The first directors are: H. D. Stubbs, 5, Wordsworth Crescent, Harrogate; and F. P. Kitchin, Fulwith Gables, Fulwith Road, Harrogate. Registered office: 13, Otley Road, Harrogate, Yorks.

Radio and Electrical Supplies (Southport), Ltd.—Private company. Registered August 2nd. Capital, £650 in £1 shares. Objects: To carry on the business of radio and electrical contractors and suppliers, &c. The permanent directors are: W. V. L. Webster, Brading, Morecambe Road, Lancaster; and three others. Secretary: H. Dunkinson.

Langley Welding Co., Ltd.—Private company. Registered August 8th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electric, oxy-acetylene and other welding, &c. The subscribers are: J. L. Thompson, 8, North Park, Iver, Bucks, and two others. Secretary: M. Butt, 25, The Drive, Harrow Garden Village, Middlesex.

Wallbrook Manufacturing Co., Ltd.—Private company. Registered July 29th. Capital, £1,025 in 1,000 10 per cent. cumulative preference shares of £1 and 100 ordinary shares of 5s. Objects: To carry on the business of manufacturers of and dealers in electric, gas and oil fires, stoves, cookers, lamps, quartz lamps, reflectors, &c. The directors are: W. Brooksbank, Laurel Bank, Embsay, Skipton, S. E. Brown, Bank Buildings, Skipton, and T. B. Paine, 44, Penberth Road, Catford, S.E.6. Solicitors: Charlesworth & Wood, Bank Buildings, Skipton.

Returns of Electrical Companies

Wilkinsons (London), Ltd.—The nominal capital has been increased by the addition of £4,000 beyond the registered capital of £1,000. The additional capital is divided into 4,000 5 per cent. non-cumulative preference shares of £1 each; 200 £1 ordinary shares in the original capital have been converted into 2,000 ordinary shares of 2s. Satisfaction to the extent of £1,000 on April 28th, 1934, of debenture dated June 1st, 1931, and registered June 18th, 1931. (Notice filed July 31st, 1935.)

John Dugdill & Co., Ltd.—Satisfaction to the extent of £3,000 on July 29th, 1935, of debenture dated October 30th, 1930, and registered November 7th, 1930. (According to the register of mortgages, the debenture registered November 7th, 1930, originally secured £3,000.)

Pulford Brothers, Ltd.—Satisfaction to the extent of £500 on July 3rd, 1935, of mortgage dated June 20th, 1933, and registered June 26th, 1933.

Thermo Path Co., Ltd.—Capital, £3,260 in 3,069 preference shares of £1 and 3,826 ordinary shares of 1s. Return dated January 4th, 1935. 3,069 preference and 3,820 ordinary shares taken up. £3,114 paid on 3,069 preference and 900 ordinary shares. £146 considered as paid on 2,920 ordinary shares. Mortgages and charges, nil.

Wilts Wholesale Electrical Co., Ltd.—Capital, £2,000 in £1 shares. Return dated January 11th, 1935. All shares taken up. £466 paid. £1,534 considered as paid. Mortgages and charges, nil.

Siemens Schuckert (Great Britain), Ltd.—Capital, £30,000 in £1 shares. Return dated January 11th, 1935. 29,400 shares taken up. £29,400 paid. Mortgages and charges, nil.

Santon, Ltd.—Capital, £4,000 in £1 shares. Return dated January 5th, 1935. All shares taken up. £2 paid. £3,998 considered as paid. Mortgages and charges, £4,400.

Woodward, Smith & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated January 12th, 1935. 373 shares taken up. £373 paid. Mortgages and charges, nil.

Ceara Tramway Light & Power Co., Ltd.—Particulars filed of £30,000 debenture stock (with power to issue £20,000 further stock), authorised by resolution dated May 8th, and covered by trust deed dated July 31st, 1935, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £30,000. Trustees: Union Commercial Investment Co., Ltd.

Harry Rawlings & Co., Ltd.—Debenture dated July 29th, 1935, to secure £600, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Henry J. Wilson, 25, Mallet Road, London, S.E.13.

Escott Brothers, Ltd.—(A) Mortgage dated July 19th, 1935, to secure £700, charged on 109, Maybank Road, Woodford, Essex. Holders: Woolwich Equitable Building Society. (B) Mortgage on 68, High Road, Woodford, Essex, dated July 8th, 1935, to secure all moneys due or to become due from the company to Lloyds Bank Ltd., not exceeding £1,500.

Universal Electric Time & Telephone Systems, Ltd.—Mortgage, dated July 26th, 1935, to secure £500 and further advances, amounting therewith to £1,500, charged on the book debts of the company and contracts in relation thereto. Holders: Wm. and Jno. Lockett, Ltd., Salisbury House, E.C.

Electric & General Industrial Trusts, Ltd.—Satisfaction to the extent of £4,300 on October 5th, 1933, and to the extent of £5,000 on July 1st, 1935, of debentures authorised July 10th, 1930, and registered July 14th, 1930. (According to the register of mortgages, the debentures registered July 14th, 1930, originally secured £25,000.)

Elliott & James, Ltd.—Debenture dated July 25th, 1935, to secure £300, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Henry Elliott, Remus Bungalow, London Road, Dunkirk, Kent.

Allen West & Co., Ltd.—Second debenture dated July 24th, 1935, to secure £40,000, charged on the company's undertaking and property, present and future, including uncalled capital (being a specific charge on the company's freehold property at Woolston, Southampton, Coombe Road, Preston, Brighton; and Dewe Road, Preston, Brighton), subject to first debentures. Holders: Industrial and General Trust, Ltd.

Yorkshire Switchgear & Engineering Co., Ltd. (formerly Tramway Supplies, Ltd.).—Satisfaction in full on July 19th, 1935, of mortgage dated December 8th, 1919, and registered February 3rd, 1920, securing £6,000.

Kershaws (Electrical Engineers), Ltd.—Capital, £1,000 in £1 shares. Return dated December 20th, 1934 (filed March 16th, 1935). 252 shares taken up. £2 paid. £250 considered as paid. Mortgages and charges, £3,300.

Invincible Electrical Engineering Co., Ltd.—Capital, £1,000 in £1 shares. Return dated January 11th, 1935. 400 shares taken up. £400 paid. Mortgages and charges, nil.

Power & Lighting Cables, Ltd.—Capital, £10,000 in £1 shares. Return dated January 31st, 1935. 1,100 shares taken up. £1,100 paid. Mortgages and charges, nil.

City Notes

The Singapore Traction Co., Ltd., is holding an extraordinary meeting on September 18th, at which resolutions will be submitted for the creation of £250,000 5 per cent. convertible first mortgage debenture stock, approving a conditional agreement of July 25th last with the Shanghai Electric Construction Co., Ltd., and increasing the capital by the creation of 150,000 further ordinary shares of £1 each. It is proposed to make a first issue of £75,000 at par to pay off the existing debenture stock, the holders of which will be given the right to exchange into the new 5 per cent. stock with a cash adjustment. A further issue will then be made of £100,000 of the new stock at par to raise the £100,000 payable to the Shanghai Electric Construction Co., Ltd., on the termination of the agreement with that company under which the latter manages the Singapore Traction Co.'s undertaking, but if the legislative sanction to this agreement is received in time the two issues may be made together. The balance of £75,000 will be available for future needs. The increase of capital is proposed merely to provide shares to meet the conversion and option rights to be conferred by the new debenture stock should such rights to be exercised, and no other issue of the new shares is contemplated.

The Southern Areas Electric Corporation, Ltd.—In accordance with a requisition, an extraordinary general meeting will be held on September 20th next, to consider resolutions for increasing the maximum number of directors from seven to eleven. A circular to the shareholders says that those shareholders responsible for the resolution intend to propose Messrs. A. H. Dykes, R. l'E. Bryce, R. C. Griffith and Sir Charles S. Williams for election as directors. The circular also states that the directors, with the exception of Mr. S. G. Gates, do not consider the proposed increase in their number necessary or desirable, and they propose to issue to shareholders in due course a statement setting out the circumstances in which the requisition has been made. The present directors are Lord Elibank (chairman), Sir Arnold B. Gridley, Messrs. A. A. Douglas, C. Gane and S. G. Gates.

The London Passenger Transport Board has announced that the Minister of Transport has prescribed that the period within which the Board shall submit to him its reports and accounts for the years 1933-34 and 1934-35 shall be not later than October 31st next, and that a payment to the holders of London Transport "C" stock on account of interest in respect of the first and second years of the Board's operations shall be made by the same date. The Board will meet on October 3rd to determine the rate of such payment and will arrange the payment during that month accordingly.

Cowans Sheldon & Co., Ltd., report a loss for the year ended June 30th last of £6,846, as compared with £6,592 for the preceding year. This is deducted from £42,876 brought forward, leaving a credit balance of £36,029, from which it is proposed to pay a dividend of 5 per cent. (same), leaving £28,529 to be carried forward.

Edmundson's Electricity Corporation, Ltd., reports that the results of the operations of its group of companies during July as compared with the corresponding month of 1934, show an increase of 19 per cent. of kWh sold.

The Palestine Electric Corporation has recommended a dividend of 7½ per cent., tax free, on the ordinary shares for 1934 (against 5 per cent., less tax, for 1933).

The South Metropolitan Electric Light & Power Co., Ltd., is again paying an interim ordinary dividend of 3 per cent.

The Folkestone Electricity Supply Co., Ltd., has announced an interim ordinary dividend of 4 per cent., tax free (same).

Stocks and Shares

TUESDAY EVENING.

THE principal feature in the Stock Exchange markets is the unusual amount of business that is going on, considering the season of the year. It is very rarely that August produces anything like animation in stocks and shares, or violent fluctuations in prices. The present month is, however, proving an exception. In spite of the number of holiday makers who are away, the number of bargains transacted every business day in the Stock Exchange is remarkably large. Moreover, there is a strong preponderance of buyers, with the result that very few departments round the House give any indication of being neglected. It is true that the mining markets and the section given over to rubber shares fail to attract much popular interest. Electrical equipment and manufacturing shares are still very much in the ascendant. The prevailing note is one of optimism, and it may be noticed that, concurrently with the activity in British stocks, the Wall Street Stock Exchange is attracting money from Americans who, for months past, have refrained from entering the Stock Exchange markets.

Public Boards' Stocks

Central Electricity fives of 1955-1975 have reached 120. Other stocks in this group are firm, and the London Electric Transport Finance Corporation 2½ per cent. stock is up to 10s. premium.

Investment and speculation are both keenly interested in the final dividend for the year that is due to be declared on the "C" stock of the London Transport Board. Hopeful holders of the stock look for 3 per cent., making 4½ per cent.

for the year, while the cautious side leans to the view that the dividend will be 2½ per cent., to make 4 per cent. The price of the stock is 1 better at 99.

The programmes of electrification put forward by the railway companies continue to draw money into the shares of the companies that are likely to benefit from the contracts which such electrification will involve, though the demand for these shares is becoming rather more specialised than it was.

Home Electricity Shares

On Monday in this week a number of prices of shares in the London electricity supply list were quoted ex the usual half-yearly dividends. The deductions made so little difference to prices that, apart from a nominal lowering here and there, quotations remain practically as they were. Bournemouth and Poole moved up to £4 a share. Midland Electric Power are better at 42s. 6d., and Yorkshires at 45s. 6d. have put on 1s. In the London group, firm features are provided by County of London, South London and North Metropolitan. The amount of stock on offer in this group is comparatively small. It may be of service to mention that £5,000 London Associated Electric Undertakings ordinary shares are on offer at 36s., to yield 3¼ per cent. on the money. Also there are 1,000 shares available, at approximately the prices given in our tables, of County of London, Metropolitan, North Metropolitan and City of London ordinary shares. There are 5,000 Llanelly and District ordinary that can be bought at 25s. 6d., yielding £3 18s. 3d. per cent., and 5,000 Scottish Power ordinary at 43s. 6d., to give 3½ guineas per cent. The Llanelly Company has been paying dividends once a year, in March; in each of the last two years, the dividend was 5 per cent. per annum.

The Palestine Electric Corporation, of which the Marquis of Reading is chairman, has announced a dividend of 7½ per cent. tax free on the ordinary shares, for 1934. This is up to the expectations that were responsible for the previous rise, and the price is another 3s. up at 50s. 6d.

Television

The announcement this week of the arrangements made for setting up a television station at the Alexandra Palace has given a fillip to interest in the Stock Exchange market for television shares, of which, in the Baird Company, there are three classes: the "A" ordinary shares, the 10 per cent. non-cumulative 5s. preferred ordinary, and the 5s. deferred ordinary. The Marconi-E.M.I. Television shares are held jointly by the Electric & Musical Industries, and Marconi's Wireless Telegraph Company, which latter is, of course, controlled by Cable & Wireless (Holdings). The E.M.I. shares are a popular speculation in the Stock Exchange, and the shares, which at one time last year were down to 17s., are now about 27s. 9d. A few months ago they were up to 35s. Bairds are 57s. 6d., 5s. 9d. and 9s. for A, preferred and deferred respectively.

Cable and Wireless

The principal point of interest in the Cable & Wireless group is a rise of 2s. 6d. to 6s. premium in the recently issued Cables Investment Trust 4½ per cent. preference shares, those which, it was suggested three weeks ago, were reasonably valued at their then price of 1s. 6d. premium. The 3½ per cent. debenture stock has hardened to 15s. premium. Cable and Wireless stocks are steady, the "A" ordinary, after a drop to 25¾, recovering to 27½. Speculation has been quietly picking up the "B" ordinary stock, regarding it as good option money for the future. Great Northern Telegraphs have advanced to 40. The strength of the market as a whole is well maintained, and a general rise in American issues served to advance the price of Western Unions to 51.

Equipment and Manufacturing

This group shows pronounced strength. Of the "big" shares, Callender's, Henley's and General Electrics, all show improvements. Ericsson Telephones have risen to 7½. Johnson & Phillips are better at 4s. 6d. British Aluminium strengthened to 45s. Telegraph Condenser shares recovered to 48s. 6d. There has been an inquiry for Siemens 10 per cent. preference, and the price advanced to 35s. 6d. Enfield Cable ordinary shares are ex dividend. Ever-Readys came into demand, and the price advanced sharply. Cromptons have been a quieter market, the price keeping about 68s. 9d. Reyrolle shares are better at 65s. Associated Electrical and Electric Constructions have moved up. Hall's Telephones hardened to 23s.

American Improvement

By one of those kaleidoscopic changes of sentiment which are more common in New York than they are in London, a complete change has come over the aspect of American stocks and shares, more especially those of the railroad and the utility companies. President Roosevelt still seems bent upon giving no encouragement to the utilities, but for all that, the prices of shares in the principal companies have been going ahead. In this strength, the Canadian share prices —Montreal Light & Power, Shawinigan Water, &c.—are mildly participating. Speculative interest is paying active attention to the shares in the American group, and there is more doing in them than there has been for a long time past. American Telephone & Telegraph shares have risen 5 to 139¼. Internationals are up to 12½. But from the spectacular point of view, British Electric Traction deferred stock easily takes pride of place in this week's fluctuations. At 1225, the price shows a gain of 75 points.

Share List of Electrical Companies

	Nom.	Dividend 1933.	Dividend 1934.	Price Aug. 13.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	4/–	+⅛	3 15 0
Brompton Ordinary	1	7	7	34/-xd	+6d.	4 2 4
Charing Cross Ordinary	1	7	7	34/6	—	4 1 2
Chelsea	1	7	7	34/6xd	+6d.	4 1 2
City of London	1	7½	7½	37/9	+3d.	3 19 6
Clyde Valley	1	7	8	44/–	—	3 12 9
County of London	1	10½	10½	59/–	+1/–	3 11 2
Edmundson's 7% Pref.	1	7	7	36/–	—	3 16 9
Elec. Dis. Yorkshire	1	9	9	49/6	+6d.	3 12 10
Elec. Supply Corporation ...	1	11	11	3⅞	—	3 8 9
Kensington Ordinary	1	7	7	34/6xd	+6d.	4 1 2
Lancs Light and Power	1	7½	7½	39/–	—	3 17 0
London Electric	1	7	8	38/6xd	+6d.	4 3 0
Metropolitan	1	10	10	53/6xd	+6d.	3 14 9
Midland Counties	1	7	7	39/6	—	3 10 10
Mid. Elec. Power	1	8	8	42/6	+6d.	3 15 3
North Eastern Electric Ordinary	1	6	6	34/–	—	3 10 8
Do. 7% Pref.	1	7	7	36/–	—	3 17 9
Northampton	1	10	10	53/9xd.	+6d.	3 14 1
Notting Hill 6% Pref.	10	6	6	14½	—	4 1 4
North Met. Elec. Ordinary ...	1	10	10	60/9xd	+⅛	3 5 10
Do. do. 6% Pref.	1	6	6	33/–	+1/–	3 12 9
St. James and Pall Mall	1	7	8½	34/-xd	+6d.	4 17 1
Scottish Power	1	8	8	42/6	—	3 15 4
South London	1	7	7	36/–	+1/–	3 17 9
Westminster Ordinary	1	7	7	34/6xd	+6d.	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	25/–	—	6 0 0
Yorkshire Elec.	1	8	8	45/6	+1/–	3 10 4
PUBLIC BOARDS.						
Central Electricity, 1950–70 ...	Stock	5	5	116	—	4 6 2
Do. 1955–75 ...	„	5	5	120	+1	4 3 4
Do. 1951–73 ...	„	4½	4½	110	—	4 1 10
Do. 1963–93 ...	„	—	3½	104	—	3 7 0
London & Home Counties, 1955–75	„	4½	4½	113	–½	3 19 8
London Passenger Transport, A...	„	—	4½	124½	—	3 12 3
Do. do. B...	„	—	5	127½	—	3 18 9
Do. do. C...	„	3	—	99	+1	3 0 7
West Midlands Joint Elec. 1948–68	„	—	5	115	—	4 7 0
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	139½	+5	6 9 1
Anglo-Am. Tel. Pref.	Stock	6	6	116½	—	5 3 0
Do. Def.	„	1½	1½	27½	—	5 9 1
Cable & Wireless 5½% Pref. ...	„	2¾	4½	103½	+1	3 19 9
Do. A. 7½% Ord.	„	Nil	Nil	27½	+1	—
Do. B. Ord.	„	Nil	Nil	7¾	+¼	—
Globe Tel. & Tel. Ord.	10	2½	3½	13⅜	–⅜	2 11 4
Do. do. Pref.	10	6	6	14	–½	4 5 9
Great Northern Tel.	10	20	20	40	+1	5 0 0
Marconi-Marine	1	10	7½	33/9	+⅛	4 9 0
Oriental Telephone Ord.	1	12	12	3½	—	*3 13 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	2/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	„	5	5	1225	+75	—
Do. do. Pref. Ord.	„	8	8	179½	–¼	4 8 10
Brazil Traction	100	—	—	8½	–¼	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	98½	—	5 1 6
Mexican Light Common	100	Nil	Nil	2½	–¼	—
Do. 7% Pref.	100	7	7	4½	—	—
Do. 1st Bonds	$500	5	5	40½	–2	—
Victoria Falls Ord.	1	20	20	8½	+¼	2 5 0
Yorkshire (West Riding) ...	1	5	6½	33/9	—	3 17 0
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	15	3	—	5 0 0
Assoc. Elec. Ord.	1	4	6	38/–	+6d.	3 3 2
Do. Prf.	1	8	8	37/6	—	4 5 4
Babcock & Wilcox	1	6	8	52/6	—	3 1 0
British Aluminium Ord.	1	5	7½	45/–	+1/–	3 6 8
British Insulated Ord.	1	5	15	4½	—	3 6 8
Brush Ord.	Stock	Nil	Nil	42½	—	—
Callender's	1	15	15	3⅛	+⅛	3 18 9
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord. ...	5/–	—	12½	3⅞	—	0 18 6
Do. 8% Pref.	1	8	8	37/6	+⅛	4 5 4
Edison Swan 1st Pref.	1	7½	7½	27/6	—	5 9 0
Electric Construction	1	Nil	3½	27/–	+1/–	2 11 10
Enfield Cable Ord.	1	25	25	5⅛xd	+6d.	4 16 5
English Electric	1	Nil	Nil	1	—	—
Do. do. Pref.	1	Nil	Nil	23/9	—	—
Ever Ready	5/–	35	35	24/3	+¼	7 1 8
Ferranti Pref.	1	7	7	28/–	–3d.	5 0 0
G.E.C. Pref.	1	6½	6½	33/9	—	3 17 4
Do. Ord.	1	8	10	61/–	+6d.	3 5 7
Henley's	1	30	30	7	+⅛	4 2 10
Do. 4½% Pref.	5	4½	4½	5½xd	+1/6	3 16 8
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	5	7½	44/6	+9d.	3 7 6
Siemens Ord.	1	6½	4	25/–	—	3 4 0
Telegraph Construction	£1	Nil	Nil	26/3	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1933

27687. "Coin-feed prepayment mechanism for electricity, gas, and similar meters." United Gas Industries, Ltd., H. E. Angold, and A. J. Christian. October 7th, 1933. (431771.)

27915. "Electrically operated devices for transmitting motion to a distance." Bopp & Reuther Ges. October 10th, 1932. (431850.)

28502. "Method of and arrangement for avoiding the cross-current error in Braun tubes." Radioakt.-Ges., D. S. Loewe, and K. Schlesinger. October 17th, 1932. (431773.)

28503. "Braun tubes." Radioakt.-Ges., D. S. Loewe, and K. Schlesinger. October 21st, 1932. (431774.)

28504. "Braun tube and method of operating these tubes." Radioakt.-Ges., D. S. Loewe, and K. Schlesinger. October 17th, 1932. (431775.)

29001. "Television and the like systems." G. W. Walton. October 19th, 1933. (432017.)

32346. "Electromagnetic switches." British Thomson-Houston Co., Ltd. November 19th, 1932. (432099.)

32422. "Electrical circuit-control devices." Weston Electrical Instrument Corporation. September 8th, 1933. (432100.)

34833. "Process and means of sorting punched cards mechanically and electrically." M. Jacob. December 10th, 1932. (431934.)

34988. "Calling impulse transmitters for automatic telephone systems or the like." E. Shipton and O. D. Kennedy. December 12th, 1933. (Cognate applications, 7176/34 and 23565/34). (431855.)

35244. "Tuning-indicating means for wireless receiving apparatus." General Electric Co., Ltd., and W. H. Peters. December 14th, 1933. (432021.)

1934

942. "Device for use in generating and amplifying alternating currents." E. Habann. January 13th, 1933. (431861.)

972. "Automatic voltage-regulating means." General Electric Co., Ltd., and J. W. Gibson. January 10th, 1934. (431784.)

1157. "Method for the production of junction boxes used in conjunction with lead-covered cable electrical wiring systems." R. H. Grierson. January 12th, 1934. (431862.)

1428. "Terminal arrangements for electric cables." Enfield Cable Works, Ltd., A. Bowden and E. Bowden (legal representatives of E. Bowden, deceased), and S. Chaplin. January 15th, 1934. (431864.)

1463. "Automatic voltage-regulating means." General Electric Co., Ltd., J. W. Gibson and H. H. Taylour. January 15th, 1934. (Cognate application, 5198/34.) (432106.)

1564. "Automatic charging arrangements for storage batteries." Telefon. A.B. L. M. Ericsson. January 19th, 1933. (431792.)

1618. "Electric communication systems." E. Boselli and C. Carnevali. January 18th, 1933. (431794.)

1839. "Telephone systems." Siemens & Halske Akt.-Ges. January 18th, 1933. (431946.)

1854. "Electric motors." P. A. H. Mossay and G. J. Scott. January 18th, 1934. (431947.)

1947. "Telephone systems." Standard Telephones & Cables, Ltd. (L. Kosma and F. A. Roome). January 19th, 1934. (432039.)

1951. "Filter circuit arrangements and resistance units for use therein." Marconi's Wireless Telegraph Co., Ltd., and F. M. Wright. January 19th, 1934. (432040.)

1956. "Device for producing extremely high impulses of energy of short duration." Vertriebs-Ges. des Leipziger Leichtmetall-Werk. January 21st, 1933. (432041.)

2023. "Electrical cooking apparatus." H. B. Frankham. January 20th, 1934. (431873.)

2031. "Methods of applying vulcanised insulation to cables." Electrical Research Products, Inc. January 31st, 1933. (432110.)

2081. "Constructions of aerial systems for use on short waves." Marconi's Wireless Telegraph Co., Ltd., N. E. Davis and F. J. Ainsley. January 20th, 1934. (432113.)

2082. "Traffic-control signals." Automatic Electric Co., Ltd., T. P. Preist and A. P. B. Renshaw. January 20th, 1934. (432114.)

2249. "Multiple-contact regulating and like electric switches." F. Williams. January 22nd, 1934. (432126.)

2259. "Electric time switches for wireless receiving sets." A. H. Shiers. January 23rd, 1934. (431796.)

2517. "Direct-current dynamo-electric machines." G. M. Pestarini. January 24th, 1934. (432127.)

4319. "Pneumatically operated electrical contactors." Allen West & Co., Ltd., and W. J. Paddock. February 9th, 1934. (432049.)

5085. "So-called disturbance-suppressors for use in connection with wireless receivers." Belling & Lee, Ltd., and E. M. Lee. February 15th, 1934. (431882.)

6122. "Radio receiving apparatus." C. R. L. Barrett and N. Maddock. February 24th, 1934. (432135.)

7084. "Electric illuminating lamps." Asch-Beck Corporation. March 6th, 1933. (432057.)

7370. "Regulation of power interchange between electric power lines." Siemens-Schuckertwerke Akt.-Ges. March 8th, 1933. (431949.)

9324. "Submersible electric motors." Pulsometer Engineering Co., Ltd., and B. H. Gibbs. March 24th, 1934. (431886.)

11579. "Gas or vapour-filled electric-discharge devices." Telefunken Ges. für Drahtlose Telegraphie. May 17th, 1933. (431889.)

12201. "Devices comprising an electric-discharge tube." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 24th, 1933. (432136.)

16236. "Electric-discharge lamps." Siemens Electric Lamps & Supplies, Ltd., P. D. Oakley and J. N. Aldington. May 31st, 1934. (431810.)

17685. "Method of storing and transporting light-sensitive material for use in television systems." Fernseh Akt.-Ges. June 15th, 1933. (Addition to 31239/33.) (431959.)

18302. "Holders or clamps for electric commutator brushes." P. Casal. June 20th, 1933. (431962.)

18562. "Electric lamps of the multi-filament type." J. Ismay & Sons, Ltd., and J. Ismay. June 22nd, 1934. (431894.)

20108. "Automatic traffic control systems." F. Von Opel. July 8th, 1933. (Addition to 415852.) (432148.)

23666. "Electric spot welding installations." D. Sciaky. May 30th, 1934. (431977.)

24744. "Wireless receiving sets, television receiving apparatus, or radiogramophones." J. E. Kinnear. January 25th, 1935. (431819.)

26315. "Cooling of enclosed electric motors." Ateliers de Constructions Électriques de Charleroi. September 19th, 1933. (431822.)

26478. "X-ray tubes." E. Pohl. April 14th, 1934. (Cognate application 26479/34.) (432154.)

28475. "Cooling field-magnet rotors of turbo-generators." F. Punga. October 5th, 1933. (Cognate application 28476/34.) (431824.)

29034. "Electric systems for automatically signalling hits on targets to a distant point." K. Urban. October 10th, 1934. (432156.)

29450. "Electric welding system." Igranic Electric Co., Ltd. October 13th, 1933. (431965.)

31124. "Apparatus for the automatic regulation of rectifiers." Westinghouse Brake & Signal Co., Ltd. December 30th, 1933. (431898.)

32142. "Electrical induction heating devices." B. Erichsen. November 8th, 1934. (431990.)

32687. "Cathode-ray oscillographs for television and other purposes." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. November 14th, 1933. (Cognate application 32688/34 and 32689/34.) (431827.)

33051. "Electric control circuits." British Thomson-Houston Co., Ltd. November 16th, 1933. (431992.)

33354. "Safety contact device for electrically controlled lifts, particularly for hatchway and cage gates." Inventio Akt.-Ges. December 24th, 1933. (432160.)

33760. "Thermionic valve circuit arrangements." Marconi's Wireless Telegraph Co., Ltd. August 18th, 1934. (431900.)

34859. "Apparatus for observing the carbons in projection arc lamps." F. B. Dehn (Zeiss Ikon Akt.-Ges.). December 4th, 1934. (431902.)

35550. "Electric submarine signalling cable systems." Electrical Research Products, Inc. December 15th, 1933. (431995.)

35555. "Synchronising of printing-telegraph installations." Siemens & Halske Akt.-Ges. December 11th, 1933. (431996.)

35707. "Television and like systems." Telefunken Ges. für Drahtlose Telegraphie December 12th, 1933. (431904.)

35875. "Means for conducting current to carbons of projection arc lamps." Zeiss Ikon Akt.-Ges. March 15th, 1933. (Divided out of 6608/34.) (431997.)

36287. "Methods of and means for electric-arc welding." British Thomson-Houston Co., Ltd. December 23rd, 1933. (431907.)

37200. "Electric plug switches." British Thomson-Houston Co., Ltd. December 28th, 1933. (431912.)

1935

1350. "Microphones." S. H. Klein. January 15th, 1935. (431914.)

2018. "Joints for electric cables." Okonite-Callender Cable Co., Inc. January 20th, 1934. (432167.)

2019. "Device for indicating a leak in an oil-filled electric cable system or the like." Okonite-Callender Cable Co., Inc. January 20th, 1934. (432010.)

2020. "Electric couplings, particularly for loud speakers of broadcast relay systems." Naamlooze Vennootschap Nederlandsche Apparaten-Fabriek Nedap, and G. Kraan. January 21st, 1935. (431917.)

2216. "Apparatus for the treatment of fluids with ultra-violet radiations and the like." Hanovia Chemical & Manufacturing Co. March 16th, 1934. (432011.)

3375. "Motor and driving wheel arrangements for electrically driven vehicles." Zavody Tatra Akciova Spolecnost pro Stavbu Automobilu a Zeleznichnich Vozu. June 28th, 1934. (431921.)

4543. "Instruments for measuring the arc-drop in vapour electric-arc apparatus." British Thomson-Houston Co., Ltd. February 13th, 1934. (432172.)

6183. "Artificially cooled mercury-vapour discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 5th, 1934. (431923.)

6597. "Junction boxes for electric conductors." H. Allday & Son (1922), Ltd., and N. Allday. March 2nd, 1935. (431924.)

6871. "Electrical signalling systems." Electrical Research Products, Inc. March 6th, 1934. (Addition to 412611.) (431925.)

7340. "Electric discharge devices." General Electric Co., Ltd. March 8th, 1934. (431845.)

7548. "Electric discharge devices." British Thomson-Houston Co., Ltd. March 15th, 1934. (432177.)

8904. "Devices for damping the cross fluxes in the slots of the armatures of commutator machines." J. T. Shevlin (Siemens-Schuckertwerke Akt.-Ges.). March 21st, 1935. (431927.)

10352. "Directional radio transmitting arrangements particularly for use with ultra-short waves." C. Lorenz Akt.Ges. April 6th, 1934. (Addition to 405727.) (431929.)

12072. "Electric water heaters." Electric Fires, Ltd., C. H. Smith and J. Dyer. April 18th, 1935. (432098.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 7th:—

Shorlon. No. 561416. Class 8. Scientific and philosophical instruments and apparatus for useful purposes.—Central Equipment Co., Ltd., 4, Shaw Street, Liverpool.

Novib. No. 560721. Class 13. Appliances made from ordinary metal for suspending overhead conducting wires for trolley buses and the like.—A.E.G. Electric Co., Ltd., 131, Victoria Street, Westminster, S.W.1.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Banstead (SURREY).—Houses, Walton-on-the-Hill, and Banstead; U.D.C. surveyor.

Barking.—Factory and offices, River Road; Hatch, Richards & Co.

Bebington.—Nurses' home and cubicle block, Clatterbridge Hospital, for Wirral Joint Hospital Board; Campbell & Honeyburne, architects, Bluecoat Chambers, School Lane, Liverpool.

Bedfordshire.—Elementary school, Stewartby; Building and Public Works Construction Co., Ltd.

Bewdley.—Houses (32), Bark Hill; Housing, Ltd., builders, Station Road, Blackheath, Birmingham.

Bideford (DEVONSHIRE).—Houses, Brickfields Estate; borough surveyor, Town Hall.

Birkenhead.—Church, Prenton Road; Woodchurch Road Welsh Church Trustees. Cinema café and shops, Rake by-pass Road; Gray & Evans.

Birmingham.—Factory, Hurst Street and Skinner Lane, for Fisher & Ludlow, Ltd.; Braithwaite & Co., Crown Bridge Works, Tipton, Staffordshire. Factory, Percy Road, Greet; Moffat & Sons, builders, Camp Hill, Birmingham.

Bolton.—Houses (126), Willows Lane; borough surveyor. Estate development, Chorley New Road; Robert Paiton & Son. Nurses' home, Hulton Lane Hospital; borough engineer. School, Topbrow; J. & N. Dickinson, Ltd. Alterations to Crompton Cinema, Crompton Way; William Harling.

Brighton.—Pavilion, County Lawn Tennis ground, electrical work (£22,255); Ringer Building Works Co.

Buckinghamshire.—Senior school, Amersham, for County E.C.

Carlisle.—Church, Raffles Estate; James Laing & Son, builders, Dalston Road.

Cheltenham.—Houses (126), Whaddon Farm Estate; D. Sansom, Cardiff. St. Gregory's school; R.C. Authorities.

Chertsey.—Mental colony, Botleys Park (£402,413); Henry Boot & Sons, Ltd.

Chesterfield.—Houses (30), Darwin Estate, for J. H. Naylor & Son.

Chichester.—Court House; city surveyor.

Colchester.—Premises, High Street, for the Prudential Assurance Co., Ltd.; Bentley Williams, builder, Oxted, Surrey.

Cromer.—Additions to Cromer & District Hospital; Management Committee.

Dalbeattie.—Houses, Moss Road (electrical work); M. Purdon Smith, architect, 95, Irish Street, Dumfries.

Darlaston.—Public baths; C. W. D. Joynson, architect.

Darlington.—Houses (400), Brankin Moor Estate, for S. Cohen.

Derbyshire.—Elementary school, New Station Road, Bolsover; J. H. Widdows, county architect, St. Mary's Gatee, Derby.

Devonshire.—Senior school, Chagford; county architect.

Doncaster.—Employment exchange; H.M. Office of Works, London, S.W.1.

Dudley.—Additions to Girls' High School, including dining hall, service kitchen, classrooms and caretakers' house; J. Whaley, clerk to Governors, Education Offices, St. James Road.

Ealing.—Houses (344), Bilton Gardens, &c.; Taylor Woodrow Estates, Ltd., Southall. Houses (34), Court Farm Road; Percy Bilton (Properties), Ltd., 113, Park Street, London, W. Houses (115), Daryington Avenue; R. Lancaster & Son, 30, Ealing Road, Wembley. Houses (22), Middleton Avenue; L. A. Culliford, architect, 58, Theobalds Road, W.C.1. Houses (20), Reading Road; Hayes Bridge Estates, Ltd., 61, Delamere Road, Hayes. Houses (32), Sunley Gardens; Dodge & Reid, architects, 72, High Street, Brentford.

East Sussex.—School, Golden Cross, Chiddingly; director of education, Lewes.

Edinburgh.—Houses, Leith, Redford Road, Granton Crescent, Pilton Drive, &c.; city architect. Residence for nursing staff (£110,000) for the Royal Infirmary; Thomas W. Turnbull, architect, Master of Works, Royal Infirmary.

Felling-on-Tyne.—Employment Exchange; H.M. Office of Works, London, S.W.1.

Flintshire.—Central school, Rhyl (£19,407), for County E.C.

Gateshead-on-Tyne.—Swimming baths, Shipcote (£34,200); A. Pringle, Ltd., builders, Cramer Dykes.

Gravesend.—School, Wrotham Road (250 places), for Church of England managers; H. J. Powell, chairman.

Halifax.—Swimming bath, Manor Heath (£14,500); borough surveyor.

Hampshire.—Senior school, Portchester; director of education, Winchester.

Harrow.—Factory, adjoining Whitefriars School; Energen Bread Co.

Hell's Mouth (CAERNARVON).—Aerodrome and naval base; Air Ministry.

Hertfordshire.—Police station, Clarendon Road, Watford, for C.C.

Hetton-le-Hole.—Additions to the Pavilion Cinema; W. and T. R. Milburn, architects, 17, Fawcett Street, Sunderland.

Kirkcudbright.—Houses (32); burgh surveyor.

Leamington.—Factory, Packmores Estate, for the Norman Engineering Co., Ltd.

Leeds.—Central baths, New York Road and Quarry Hill; Corporation Baths Committee.

Leominster.—Cinema at the corner of South Street and Westbury Street; E. S. Roberts, architect, Birmingham.

Liverpool.—Juniors' and infants' school, Great Crosby; S. Wilkinson, architect, County Offices, Preston. Alterations to Smithdown Road Hospital; land steward and surveyor.

London.—(CHELSEA).—Rebuilding, Carlyle School; Management Committee. (KILBURN).—Swimming bath, Granville Road (£73,025); Council's surveyor. (WHITECHAPEL, E.1).—Swimming bath for nurses, London Hospital; secretary.

Malvern.—Cinema, Worcester Road, for D. & D. Cinemas, Ltd., 3, New Street, Birmingham.

Montgomeryshire.—Alterations to Trefnanney School; director of education, Newtown.

Morecambe.—Houses (110), Hestham Hill Estate; Harrison & Moore. Houses (40), Newtown Estate; A. Robinson & Sons. Ballroom, Central Pier; New Morecambe Pier Co., Ltd. Development of Cliffs Estate; Swithenbank & Ladell.

New Malden.—School, Sheephouse Lane; Thorogood Bros. & Son.

Newport (MONMOUTHSHIRE).—Civic centre, Clyth Park; borough surveyor.

Northampton.—Houses (32), Cartwright Road; T. Wilson & Son, Ltd. Small houses (200); borough engineer. Hotel, Broadmead Avenue; P. Phipps & Co., Ltd. Extensions to St. Andrew's Hospital, Billing Road; Governors.

North Riding.—Farm Institute, Askham Bryan Farm (£83,400), for County E.C.

Nottingham.—Employment exchange; H.M. Office of Works, London, S.W.1.

Nottinghamshire. — Secondary school, West Bridgford (£44,500), for County E.C.

Oxford.—Development of Barnes Court Estate and Iffley Turn Estate; Pye Bros.

Peterhead.—Houses, King Street and Kirk Street; burgh surveyor.

Rawmarsh.—Catholic schools; Dyson, Cawthorne & Coles, architects, 25, Regent Street, Barnsley.

Redditch.—Cinema, Unicorn Hill, for the D. & D. Cinemas, Ltd., 3, New Street, Birmingham.

Richmond (SURREY).—Extensions to Royal Hospital, including nurses' home; Brewer, Smith & Brewer, architects. Methodist Church, Sheen Road; Pothecary & Barratt, architects.

Rotherham.—Houses, Wortley Road; L. Fraser & Co. Extensions to Municipal Offices; borough engineer.

Rowley Regis.—Houses (71); borough surveyor.

Scarborough.—Additions to Town Hall; borough engineer. Houses near Filey Road, for G. Haigh; J. Petch & Sons, architects, 12, Valley Bridge Parade.

Sheffield.—Houses, Ripley Street; Simpson Bros., Ltd. Houses (26), Rotherham Road; C. S. Smith, Ltd. House, workshops and warehouses, Rockingham Street; Mawhood Bros., Ltd. Cinema, Fulwood Road; Hadfield & Cawkwell. Three washhouses, Oakes Green, Brightside and Heeley (£28,000); W. Malthouse, Ltd., and Melling Bros., Ltd.

Smethwick.—Public libraries, Thimblemill Road; Roland Fletcher, borough engineer, Council House.

Southport.—Sun lounge and ballroom, West Street; Clifton Hotel (Southport), Ltd.

South Shields.—Hotel, sea front; Durham and Northumberland Licensed Victuallers' Association. Houses (328), Prince Edward Road (£92,440); Kettlewell, Son & Co., Ltd., Hull. Houses (210), Quarry Lane (£48,050); borough engineer.

Staffordshire.—Senior girls' school, Stafford; director of education, Stafford. Extensions to Cheddleton Mental Hospital, including admission hospital, nurses' home, and convalescent villas (electrical work), for the Mental Hospital Board; H. L. Underwood, clerk, Stafford.

Stockport.—Houses (28), near Windlehurst Road, Hawk Green; Adshead & Wetherby, builders, Hawk Green.

Stockton-on-Tees.—Houses (90), Norton; Andrews (Constructions), Ltd., builders, Redcar.

Stoke-on-Trent.—Houses (114), Abbey Hulton (£35,574); C. Cornes & Son.

Stourport.—Houses (48) Minster Road; U.D.C. surveyor.

Sunderland.—Houses (442), High Southwick Estate (£128,680); F. Craven, Ltd., builders, Thornton Street, West Hartlepool.

Surrey.—Central School, Northcroft Road, Epsom, for County E.C. Police houses, various parishes (£150,000), and central school, West Byfleet; county architect.

Sutton Coldfield.—Houses (41), Clarence Gardens; H. Robinson. Houses, Green Lanes Estate; Davis & Son.

Tickhill (YORKSHIRE).—Houses (30); U.D.C. surveyor.

Torquay.—Central library; borough engineer.

Truro.—Houses (89), Tregolls; F. A. Barnes, engineer, Municipal Buildings.

Wallsend-on-Tyne.—Houses (206), in connection with slum clearance scheme; borough engineer.

Warwick.—Factory, Packmores Estate, for Norman Engineering Co., Leamington.

Warwickshire.—Extensions, to Westlands School, Rugby, for County E.C.

Westmorland.—Central Public Offices, Kendal, for C.C.; Verner O. Rees, architect, 33, Bedford Place, London, W.C.1.

Weston-super-Mare.—Bathing pool (£43,000); U.D.C. surveyor.

Whickham-on-Tyne.—Swimming baths; T. Fenbow, U.D.C. surveyor.

Whitby.—Houses (106); J. B. Abbey, surveyor.

Wigan.—Bank premises, Mesnes Street, for the Union Bank of Manchester, Ltd.

Wick.—Houses (100); burgh surveyor, Town House.

Willenhall.—Houses (24), Coppice Lane site, Short Heath; G. A. Waite, surveyor.

Wiltshire.—Senior school, Marlborough, for County E.C.

Wolverhampton.—Houses, Kingsway Road; R.C.S. Estates, Ltd. Houses (30), Three Tuns Estate; J. McLean. Extensions and alterations to Red Cross Street School; A. J. Amies & Sons, builders. Extensions to works, Birmingham Road; Accuracy Works, Ltd.

Worcestershire.—Senior school (480 places), Pedmore Road, Stourbridge; A. W. Priestley, director of education, Worcester.

Yarm (YORKSHIRE).—Houses (106), Black Hills Farm Estate, Green Lane, for J. Hodgson.